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1.0 EXECUTIVE SUMMARY

In January 1983 the Texas Department of Water Resources contracted with Lockwood, Andrews, & Newnam, Inc. in association with Environmental Science and Engineering, Inc. and Harding Lawson Associates to conduct a remedial site investigation at the French Limited abandoned hazardous waste site. The 22.5-acre site is located in Northeast Harris County, approximately 2 miles from Crosby, Texas. It is triangular in shape bordered on the northwest by U.S. Highway 90 and on the south by Gulf Pump Road. The Riverdale Subdivision lies immediately to the southwest and has an active population of approximately 100 people. East of Riverdale and immediately south of the site, Harris County operated a sanitary landfill in the 1960's on an 18.5-acre site. A portion of the landfill site is currently used on an intermittent basis as a pipe storage yard. The remaining areas surrounding the site are largely undeveloped with numerous abandoned sand pits and low-lying swampy areas. Some commercial timber operations and mineral exploration have been conducted in the past immediately north of the site. Indiscriminate dumping of household garbage and commercial refuse is prevalent along area roads and ditches. The area plays host to sport fisherman as well as water sport enthusiasts on the nearby lakes and ponds and the San Jacinto River.

Operations at the French Limited site were conducted between 1966 and 1972 during which time approximately 2.5 million cubic feet of industrial wastes were received. The majority of this waste was deposited in an unlined pit, formerly an active sand pit; however, some wastes were stored upon arrival in several large tanks and burned in an open pit process. The disposal site was operated under a temporary permit issued by the Texas Water Quality Board. This permit was revoked and French Limited was ordered to cease operations in 1973 after extensive public hearings and legal proceedings. As part of the settlement, French Limited was ordered to remove all of the site structures, tankage, and process equipment. The site was deeded to the state as a part of the settlement.

The 100-year floodplain of the San Jacinto River encompasses the entire site, and the river has completely inundated it at least four times in the recent past. During one of these flood events, the dike surrounding the waste pit was overtopped and breached, and contaminated sludges were discharged into an adjacent slough. An emergency action repaired the dike and pumped the majority of the discharged sludges back into the pit. The floating portion of these sludges was removed and disposed of during a later planned removal.

A broad sandy deposit, approximately 40 to 50 feet thick, underlies the site and forms a shallow aquifer upon which many of the local inhabitants rely for drinking water. Ground water in the shallow aquifer has been heavily contaminated in the areas immediately surrounding the waste pit by leaching action of the sludges. The ground water in the areas around the contaminated slough and south of the main waste pit indicate a much lower level of contamination. Residents of the nearby Riverdale community have in the past complained of organic odors, oily sheens, and bad taste in the drinking water from shallow wells.

Dewatering operations at surrounding sand pits has resulted in numerous shifts in area groundwater gradients with the subsequent spread of contaminants. At this time, significant groundwater contamination appears to be moving from the main waste pit to the south. Contaminants in the shallow ground water include:

- Volatile organic compounds
  - Benzene
  - Numerous chlorinated hydrocarbons
- Base/neutral organic compounds
  - Naphthalene
  - Other polynuclear aromatics
- Phenols
- Heavy Metals
  - Chromium
  - Copper
  - Lead
  - Zinc

Underlying the shallow aquifer, separated by approximately 70 feet of a hard, highly plastic clay, is a 30-foot thick sand stratum. Ground waters in this aquifer appear to have no contamination.

Underlying the two aquifers previously discussed and separated by several hundred feet of clay are the Chicot and Evangeline aquifers, the primary drinking water source for metropolitan Houston. These aquifers appear to be in little danger of immediate contamination, however should they become contaminated a large number of people could potentially be affected.

The surface of the site can be separated into distinct geographical areas, based upon land use or topography:

- The main waste pit;
- The slough immediately north and west of the pit;
- The slough and drainageways north of U.S. Highway 90;
- The Riverdale Subdivision;
- The Old Harris County Landfill; and
- The abandoned sand pit and drainageway south of the site.

The main waste pit covers an area approximately 8 acres in size and has an average depth of approximately 10.6 feet. The pit contains approximately 48,000 cubic yards of sludges and contaminated sediments and approximately 24.5 million gallons of contaminated water. The sludges are composed of a wide variety of organics including the following:

- Volatile organic compounds
  - Benzene and benzene derivatives
  - Numerous chlorinated hydrocarbons
- Base/neutral organic compounds
  - Naphthalene
  - Other polynuclear hydrocarbons
- PCBs (at greater than 50 ppm levels)
- Metals
  - Zinc
  - Chromium

The water quality in the pit appears to vary with the season; however, the contamination in the water is of the same nature as that in the sludges, except at a much lower level (ppb versus ppm). Contamination in the pit water was generally restricted to the lower layers (from bottom to approximately mid-depth).

The slough north of the main waste pit runs along the south side of U.S. Highway 90 from about the mid-point of the waste pit to a point approximately 700 feet from the westernmost portion of the pit. It is approximately 100 feet wide at its widest point but is generally 50 feet wide with depths ranging from 4 to 6 feet. The slough received the majority of wastes from the main pit when the dike was breached. Sediments in the slough exhibit the full range of contaminants found in the main pit sludges, but at much lower concentrations. Soils along the banks of the slough are littered with patches of dried and semi-dried sludges of similar composition and contaminant levels as those found in the pit. Surface waters do not appear to be affected, except for trace concentrations of metals (primarily chromium, copper, and zinc).

The slough north of U.S. Highway 90 is hydraulically connected to the slough north of the main waste pit during high water. This slough includes the "fishing hole" beneath the U.S. Highway 90 bridge immediately north of the main waste pit. From the "fishing hole" the slough runs in a westerly direction along the north side of the highway for a distance of approximately 1,500 feet. It is generally 30 feet wide with depths ranging from 4 to 10 feet. The slough is drained by a broad swampy drainageway extending from the northwest corner of the fishing hole north and west towards the San Jacinto River. Sediments in the slough exhibited trace concentrations of several base/neutral compounds and PCBs. The higher levels of contamination were seen in the sediments taken from locations hydraulically closer to the main waste pit. Surface waters were free of organic contamination but had low level concentrations of several metals. Fish tissue from specimens taken in the fishing hole indicated a low level bioaccumulation of PCBs and some metals.

Sediment samples taken in the drainageway draining the slough exhibited trace concentrations of PCBs and several base/neutrals similar to those found in the main waste pit sludges. A soil sample taken from the dry bank of the drainageway indicated trace concentrations of PCBs and two phthalate compounds.

The Riverdale Subdivision lies immediately southwest of the site across Gulf Pump Road. During flood events water flowing down the slough from the site discharges into the subdivision. Pond sediments and soils from dry drainage ditches indicated trace concentrations of PCBs and several phthalates. Fish tissue from specimens taken on a pond in the subdivision indicated a low level bioaccumulation of PCBs and some metals. The primary concern in Riverdale is the shallow ground water upon which most of the residents rely for drinking water. Groundwater samples from two residences and one monitoring well located in the subdivision indicated no organic contaminiation at the time of sampling.

Adjacent to the Riverdale Subdivision to the east is a closed Harris County sanitary landfill. The landfill appears to be leaking leachate into the ground water south and downgradient of the French Limited site. At this time the ground water beneath the landfill is downgradient of both the site and the Riverdale Subdivision.

Directly south approximately 300 feet from the French Limited site and adjacent to the old landfill is an abandoned sand pit. This pit drains into a marshy area connected to a well-defined drainageway approximately 300 feet to the south. The drainageway flows to the south and west approximately one mile to another small body of water, Rickett Lake. This entire area is on the flow path of flood waters moving across the French Limited site. Sediment samples taken from the lake immediately south of the site indicated trace concentrations of one volatile aromatic and several base/neutral organic compounds similar to those found in the main waste pit sludges. Surface water in the abandoned sand pit showed no organic contamination, however trace concentrations of several metals were found. Fish tissue from specimens taken from the lake indicated a low level bioaccumulation of PCBs and some metals. Sediments samples taken at key points along the drainageway and in Rickett Lake indicated trace concentrations of PCBs and several phthalate compounds.

The population most likely to be affected by this contamination includes:

- Residents in the nearby Riverdale Subdivision;
- Sport fishermen that frequent the fishing hole under U.S. Highway 90, and sloughs and some of the abandoned sand pits in the area; and
- Harris County Precinct 2 maintenance personnel.

The pathways by which these people may become exposed to the contamination are:

1. Consumption of contaminated ground water;
2. Ingestion of contaminated aquatic species and plants; and
3. Direct contact with contaminated soils and surface water.

Of the pathways, the first is probably the most significant. Unlike the last two, groundwater contamination has the potential to increase and spread outward unhindered with time. This movement will occur as long as a sufficient concentration of the contaminant mass remains within the French Limited site, and could eventually (as it has in the past) result in contamination of the drinking water supply for local residents.

2.0 INTRODUCTION

2.1 LOCATION

The French Limited site consists of an abandoned waste impoundment located on a 22.5-acre tract approximately two miles southwest of Crosby, Texas. The site is in Harris County, 20 miles east-northeast of Houston in the floodplain of the San Jacinto River (see Figure 2-1). The French Limited site is about 16 miles northwest of Galveston Bay.

2.2 SITE HISTORY

The site received about 100,000 barrels of industrial waste per year for six years between 1966 and 1972. The majority of this waste was disposed of in an unlined pit approximately 8 acres in size. Water in the pit had a pH of 2.3 on February 1, 1971, and contained 550 parts per million (ppm) iron (dissolved), 1,400 ppm chlorides, and over 8,000 ppm total dissolved solids. Three monitor wells installed by French Limited near the pit (reported to be 17 to 28 feet deep) contained total dissolved solids ranging from 1,060 to 2,150 ppm. The locations of these wells are unknown. Residential wells in and around the Riverdale Subdivision contained total dissolved solids ranging from 87 to 381 ppm (Public Hearing Record, February 22, 1971). Prior to this Public Hearing, area residents had complained for some time about tastes and odors in their well water. Many residents were hauling in drinking and domestic water supplies. The property was deeded to the State of Texas following extensive litigations and French Limited's final bankruptcy in 1973.

The site has been flooded by the San Jacinto River in 1969, 1973, 1979, and May 1983. The flood of 1973 flushed some contaminated water out of the pit without any complaints of damage to the downstream ecology. The flood of April 1979, caused a breach in the northern dike of the pit, providing an avenue for the discharge of contaminated sludges into the adjacent swamp north of the pit. The May 1983 flood occurred <u>after</u> the sampling for the investigation described in this report was performed. The berms around the main waste pit were inundated with approximately 2 feet of water. A previously-installed oil boom, fencing and vegetation along the berm helped to contain the floating oily residues, and very little appeared to have escaped the main pit area.

How About Flood of 1965?

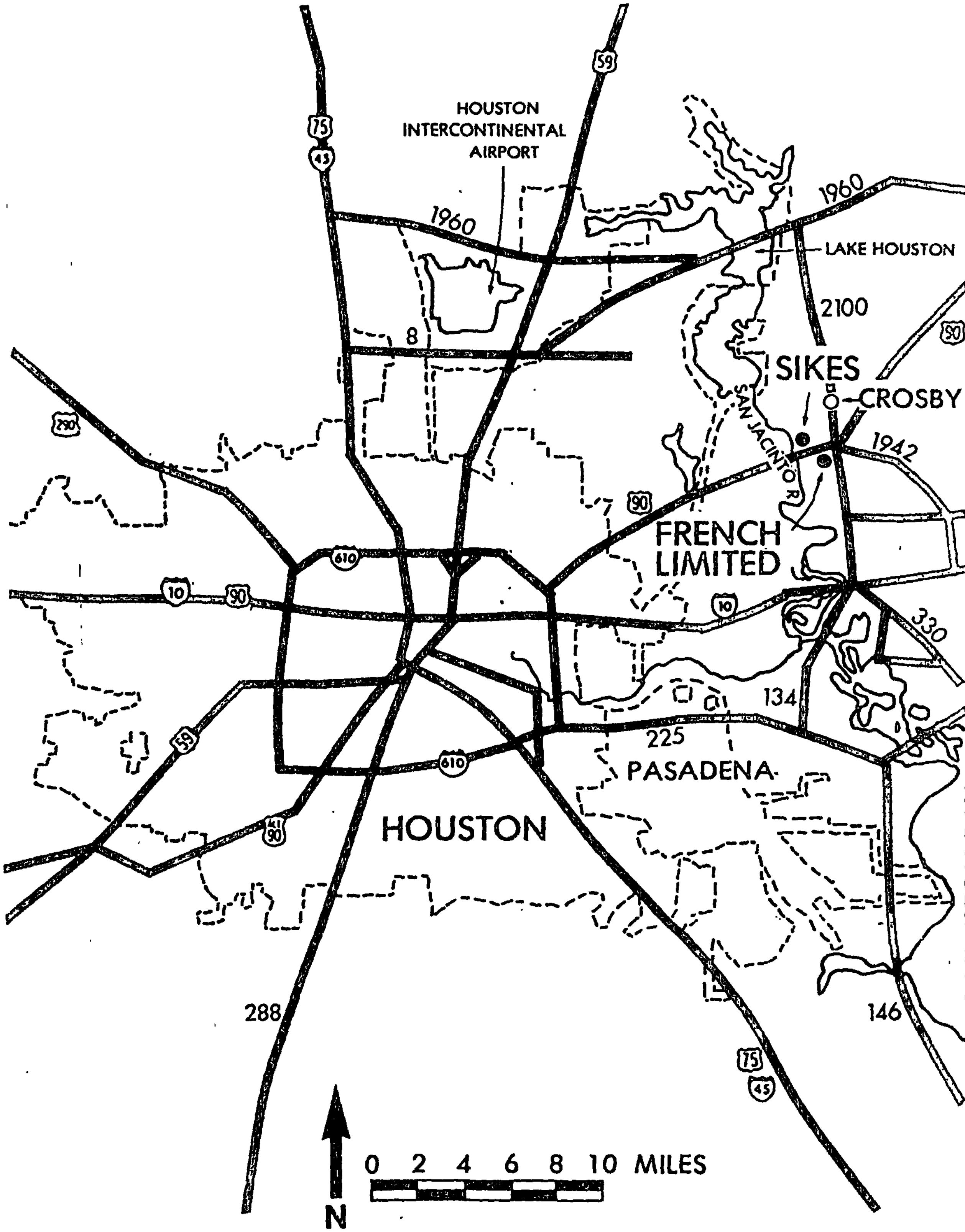


Figure 2-1 FRENCH LIMITED SITE LOCATION	FRENCH LIMITED SITE	Prepared for: TEXAS DEPARTMENT OF WATER RESOURCES IAN / ESE / HLA DATE: JUNE, 1984 PROJECT NO. 1633-20-001

Preliminary remedial actions have been taken since the 1979 flood to repair the dike which was breached and to prevent further discharge of contaminants. A limited effort was completed in 1982 to collect and remove scum and floating oily residues from the swampy area north of the dike. A portion of these floating oily residues was left contained behind a floating boom at the west end of the main pit. Following the flood of May 1983, these floating oily residues behind the boom were removed from the site by the USEPA to reduce risks during future floods.

Sampling and inspection of the French Limited main pit in June 1976 revealed that water was at a pH of about 7.5, and TOC averaged about 116 ppm. Sludges in the water of the pit exceeded 2 feet in depth, and contained 1,066 ppm total organic carbon (TOC) and 10,464 ppm zinc (TDWR Memorandum, July 9, 1976). The Harris County Pollution Control Board collected data in 1979 which indicated that the water quality in shallow residential wells near the site had improved considerably since 1971 (TDWR Memorandum, December 11, 1979).

Include memo's in Appendix

In December 1982, the Texas Department of Water Resources contracted with the LAN/ESE/HLA team to perform a remedial investigation and feasibility study of the French Limited site.

2.3 ENVIRONMENTAL SETTING OVERVIEW

The site lies about 10 feet above mean sea level and is about one mile east of the San Jacinto River. The surface drainage is southwest to the San Jacinto River. The soils are made up of sands to a depth of approximately 65 feet and clays from 65 to 125 feet. A deep aquifer exists in a confined sand stratum below a depth of 125 feet. The Upper Water-Bearing Zone beneath the site resides near surface in the shallow sands. The prevailing water surface in the disposal pit appears to conform to the water table in this Upper Water-Bearing Zone.

Forest canopy vegetation of this area consists of loblolly pine, slash pine, water oak, willow oak, elm, green ash, cottonwood, sweetgum, and in the wetter areas bald cypress. The dominant plant on site is sesban, a leguminous shrub which is common in disturbed wet areas of the region.

Deer and small mammals, such as cottontail rabbit, skunk, fox, raccoon and opossum are common. Harris County is a wintering place for geese, ducks, egrets, herons, rails, coots, gallinules, and other migratory birds.

Land use in the county is divided between cropland, pasture, and range (40 percent); forest (15 percent), with most of the remaining area being urban. Rice, grain sorghum, corn, cotton, beef cattle, and timber are the principal agricultural products, and oil refining is the chief industry. Harris County is also one of the nation's leading producer of chemicals, fertilizers, and insecticides. Galveston Bay supports commercial fishing and shellfish harvesting.

2.4 OBJECTIVES

The work program for the French Limited site was structured into two phases: investigation of site conditions (Phase I); and, if appropriate, evaluation of engineering feasibility of site control measures (Phase II). The purpose and objectives of the site investigation were to characterize the site in terms of:

1. waste materials present,
2. magnitude and extent of contamination,
3. rate and direction of waste migration,
4. target receptors, and
5. site geology and hydrology.

The objective of the feasibility study are to develop and evaluate alternative remedial measures considering technical feasibility, economic factors, environmental impacts, regulatory constraints and timeliness of completion.

This report discusses the investigation of site conditions conducted during Phase I. Two field sampling and analysis periods are covered by this report. The first intensive field investigation occurred in April 1983, when ground and surface waters as well as sludges, sediments, soils, and fish tissue were studied. This sampling was supplemented by further detailed sampling in November 1983. Air monitoring with an HNU photoionization detector at the beginning of Phase I indicated very low to undetectable levels of volatile gases in the air around the French Limited site. On this basis, further air monitoring studies were not utilized to characterize the site.

3.0 ENVIRONMENTAL SETTING

3.1 SITE LAYOUT

The French Limited site is located immediately east of the intersection of U.S. Highway 90 and Gulf Pump Road, southwest of Crosby, Texas and east of Barrett, Texas. The triangular site comprises 22.481 acres out of the Humphrey Jackson Labor Survey, Abstract 37 (see Figure 3-1). It is bordered on the south by Gulf Pump Road, on the northwest by U.S. Highway 90, and on the east by a 17.96-acre tract owned by [redacted]

The predominant feature on the site is an approximately 8-acre pit completely surrounded by an earthen dike. A small pit lies east of the main pit, and sloughs and swampy areas are located west, north, and east surrounding the pit. The most prominent of the smaller pits is the one due east of the site and the borrow pit north of the site under U.S. Highway 90. Two entrances off Gulf Pump Road provide access to a dirt road which rings approximately three-quarters of the main pit. Access to the north side of the main pit is by means of this road.

The area immediately surrounding the site is largely undeveloped with numerous abandoned sand pits and large swampy areas. The Riverdale Subdivision lies to the southwest of the site across Gulf Pump Road. The subdivision consists of acreage lots with residential housing. Adjacent to the Riverdale Subdivision to the east is a pipe storage yard located on an unimproved 36.919-acre tract out of the Reuben White Survey, Abstract 84 and owned by William Waitkus. Adjacent to the pipe storage yard due south of the main waste pit is a pit or pond approximately 3 acres in size. The remaining tracts of land south of Gulf Pump Road are undeveloped with brushy vegetation, and intermittent swampy areas predominate. The east side of the site is largely dense woods with intermittent swampy areas, garbage dumps, and some abandoned sand pits. North of the site, across U.S. Highway 90 the property is undeveloped, densely wooded, and swampy. This tract of land, 344.71 acres out of the Humphrey Jackson Labor Survey, Abstract 37 is owned by Debois, Inc. with [redacted] acting as Trustee.

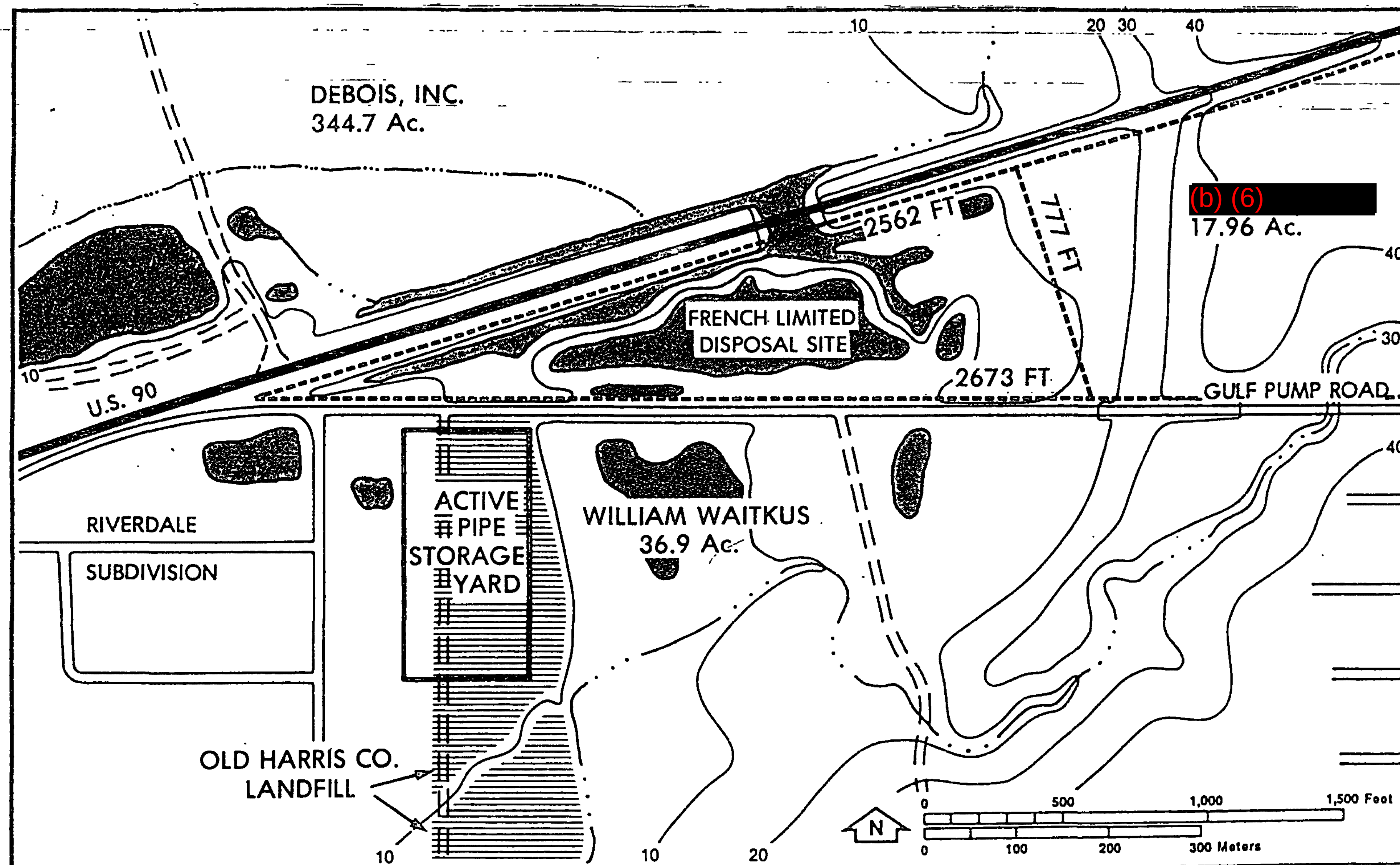


Figure 3-1
SITE LAYOUT

FRENCH LIMITED SITE

Prepared for:
TEXAS DEPARTMENT OF WATER RESOURCES

lan / ESE / HLA

DATE: JUNE, 1984 PROJECT NO. 1633-20-001

An aerial photograph of the French Limited site vicinity is shown in Appendix A. A boundary and topographic map is also included in Appendix A.

3.2 TOPOGRAPHY

The topography of the site and the surrounding area was analyzed using aerial photographs, USGS topographic maps and the Environmental Geologic Atlas of the Texas Coastal Zone--"Galveston-Houston Area," issued by the Texas Bureau of Economic Geology. This analysis was supplemented by ground reconnaissance.

The area surrounding the site contains three distinct natural topographic zones, each having different geological conditions and supporting a slightly different environmental and biological assemblage (see Figure 3-2). The three zones are simply a manifestation of the natural ~~ground surface~~ elevation and its relationship to the fluvial system of the nearby San Jacinto River.

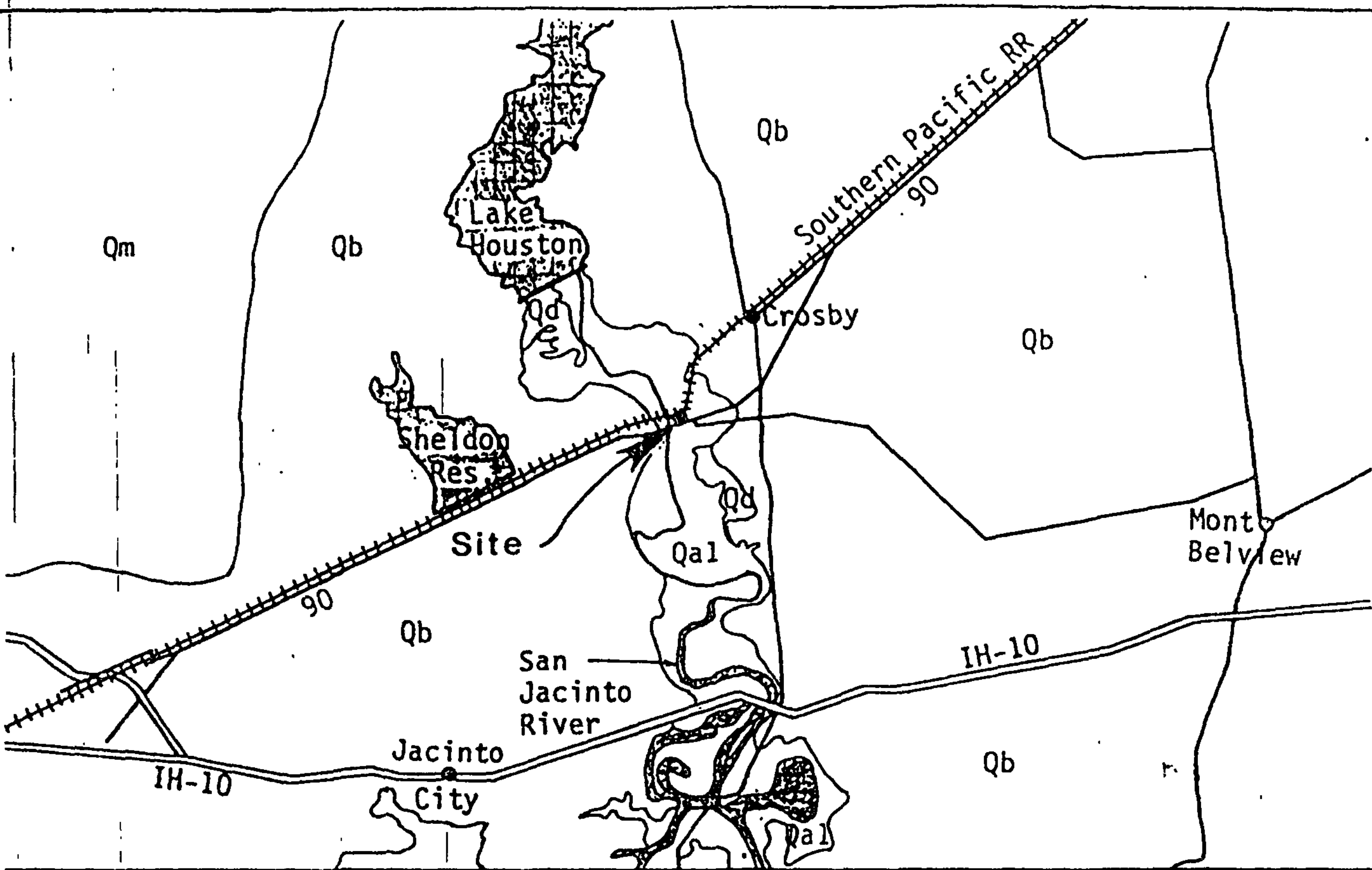
The natural zones have been significantly influenced by man-made features and structures. Dominant man-made topographic features such as roadbeds, drainage ditches, sand quarry pits, and indiscriminant dumping have changed the natural ground surface and altered the natural hydrological and biological conditions in the vicinity of the site.

Zones should be shown on Diagram.

Zone I--Zone I consists of the river floodplain that extends from the San Jacinto River to approximately 800 feet east of the main waste pit. The natural ground surface in the area varies from a high of approximately Elevation 25 feet msl (Elevations refer to Mean Sea Level Datum, 1963 Survey) in Riverdale subdivision to a low in the site area of approximately Elevation 10 feet. This zone has developed through deposition from natural flooding and overbanking of the river. Drainage is generally poor, and the area is flood prone.

At the time of the aerial survey (March 1983), the water surface in the slough north of the main waste pit was at Elevation 9.7 feet, and the water surface in the main pit was at Elevation 10.6 feet.

Man-made features at the site are the most distinguishing topographic features of this zone. The main pit, with a water surface elevation of 10.6 feet, is



EXPLANATION

Qal Alluvium

Clay, silt, and sand, organic matter abundant locally; includes point bar, natural levee, stream channel, backswamp, coastal marsh, mud flat, and narrow beach deposits, the last shown by line symbol

Qd Deweyville Formation

Sand, silt, and clay, some gravel; includes point bar, natural levee, stream channel, and backswamp deposits at a level only slightly above that of the present flood plain; sand coarser than in alluvium; surface characterized by relict meanders of much larger radius of curvature than those of present streams, some scattered pimple mounds; thickness locally more than 60 feet. High level Deweyville surfaces cut in the Beaumont Formation and high level Deweyville deposits along Trinity River are intermediate in position between the Beaumont surface and the level of most Deweyville deposits

Qb Beaumont Formation

Beaumont Formation, Qb, with barrier island and beach deposits, Qbb, mapped separately. Beaumont Formation, Qb, mostly clay, silt, and sand; includes mainly stream channel, point bar, natural levee, and backswamp deposits and to a lesser extent coastal marsh and mud flat deposits; concretions of calcium carbonate, iron oxide, and iron-manganese oxides in zone of weathering; surface almost featureless, characterized by relict river channels shown by meander patterns and pimple mounds on meander-belt ridges, separated by areas of low, relatively smooth, featureless backswamp deposits without pimple mounds; thickness 100± feet. Barrier island and beach deposits, Qbb, mostly fine-grained sand normally without shell material; surface slightly higher than that of surrounding deposits, characterized by numerous pimple mounds and rounded depressions; probably part of "Ingleside" barrier island system; thickness less than 50 feet. (Prairie Formation is a more recent name for deposits in Louisiana equivalent to Beaumont Formation in Texas)

Qm Montgomery Formation

Clay, silt, sand, and very minor siliceous gravel of granule and small pebble size, gravel more abundant northwestward, locally calcareous, concretions of calcium carbonate, iron oxide, and iron-manganese oxides common in zone of weathering; fluviatile; surface fairly flat and featureless except for numerous rounded shallow depressions and pimple mounds; thickness 100± feet. (Upper part of Lissie Formation as previously mapped)

Figure 3-2 REGIONAL GEOLOGIC MAP	FRENCH LIMITED SITE	Prepared for: TEXAS DEPARTMENT OF WATER RESOURCES lan / ESE / HEA DATE: JUNE, 1984 PROJECT NO. 1633-20-002

enclosed by a dike ranging in elevation from 13.9 to 17.4 feet. North of the pit, the road bed of U.S. Highway 90 ranges from Elevation 25.4 to 26.8 feet. South of the main pit is Gulf Pump Road which ranges from Elevation 12.3 to 17.2 feet. East of the site, Gulf Pump Road rises to an elevation of nearly 40 feet.

Another man-made topographic feature is the indiscriminant refuse dump along both sides of Gulf Pump Road southeast of the main pit that ranges in Elevation from 9.7 to 18.6 feet.

Zone II--A transition zone occurs from the edge of the floodplain to the higher grasslands just west of the City of Barrett. This transition zone is slightly sloped, rising from Elevation 10 feet to approximately Elevation 45 feet over a 1,000-foot distance. This zone is heavily wooded with mixed pine and hardwood. Although some of this zone contains marsh-like conditions typical of Zone I, it is mostly well-drained and slightly sloped. Surface soils consist of clay and sand.

Zone III--From just west of Barrett to the Cedar Bayou Basin to the east, the area is generally flat prairie uplands with elevations ranging from 45 to 55 feet. These are mostly cultivated lands. Uncultivated areas are overgrown by natural occurrences of native grasses, cactus, mesquite, huisache, and hackberry. Geologically this zone is classified as interdistributary clays with belts of distributary and fluvial sands and silts.

3.3 GEOLOGY

3.3.1 Regional Geology

The French Limited site is in the Coastal Plain Region, which consists of sedimentary materials deposited by formerly and presently active geologic processes in deltaic, alluvial, eolian dune, bay-estuarine, and barrier-island-shoreline systems (see Figure 3-3). The Southeast Texas portion of the Coastal Plain is underlain by a thick mass of sediments (in excess of 30,000 feet) that are now slightly inclined downward toward the Gulf; upper sections have been considerably eroded. Successively older geologic formations crop out progressively farther inland from the coast line.

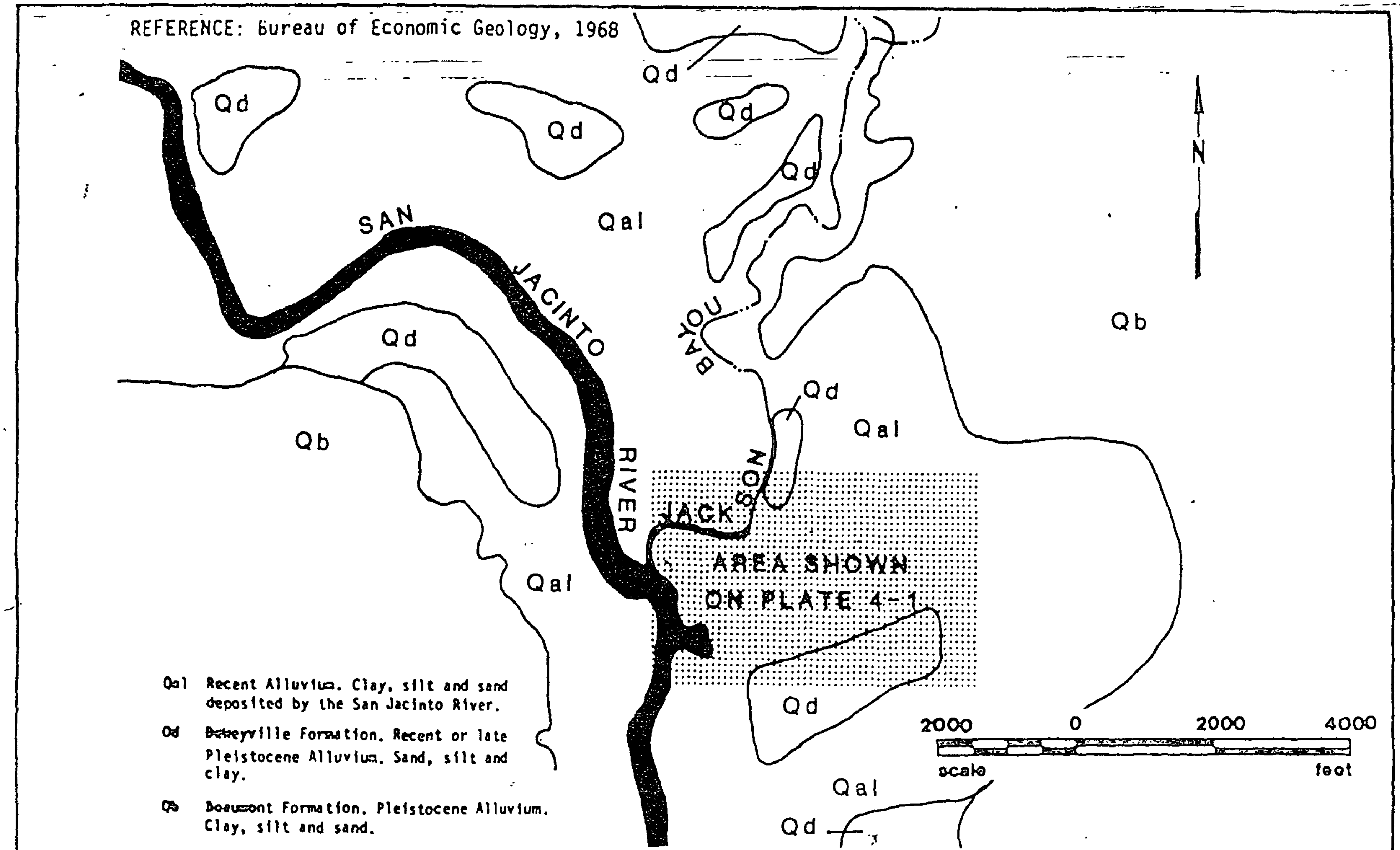


Figure 3-3
SURFICIAL GEOLOGY OF SITE AREA

FRENCH LIMITED SITE

Prepared for:
TEXAS DEPARTMENT OF WATER RESOURCES

LAN / ESE / HEA

DATE: JUNE, 1984 PROJECT NO. 1633-20-002

The deposits of the Southeast Texas Coastal Plain belong chiefly to the Tertiary Period (70 million to 3 million years old), to the Pleistocene (3 million to 0.2 million years old) and to the Holocene (0.2 million years old to present) epochs. Holocene deposits in the site area consists of river alluvium. The Holocene deposits are underlain by the differentiated formations (Beaumont, Montgomery, Bentley and Willis) of the Pleistocene epoch, which forms a very smooth, gently seaward tilted plain. The near surface formation is the Beaumont consisting of clays with interbedded silts and sands which have been deposited by river deltas and floodplains. Subsequent to their deposition, the soils were desiccated when the sea levels were much lower than they are now. Consequently, the soils are overconsolidated, generally have high strengths and typically have a blocky secondary structure with some slickensides.

The low relief that characterizes the Coastal Plain is occasionally disrupted by entrenched streams. These include cut channels across the plain that are actively growing through headward erosion.

The Houston area is located in a Seismic Zone 0 according to the Uniform Building Code. The primary geologic hazards in the area are subsidence caused by deep groundwater withdrawal and related ground faulting. Ground faults in the Houston area are generally inclined 60 to 75 degrees from the horizontal, extend downward for thousands of feet, and are roughly parallel to the coast. Based upon a review of available data sources, no known faults pass through the site area.

Maximum subsidence in the Houston area has exceeded 8 feet over the last 75 years. Based on elevation corrections of USGS Bench Mark D690, approximately 4,000 feet west of the site, the site subsided 0.93 feet between 1963 and 1973 and 0.32 feet between 1973 and 1978.

Elevations presented in this text are based on the 1963 datum. For a rough approximation of the 1983 elevations, subtract 1.5 feet from the 1963 elevation.

3.3.2 Local Geology

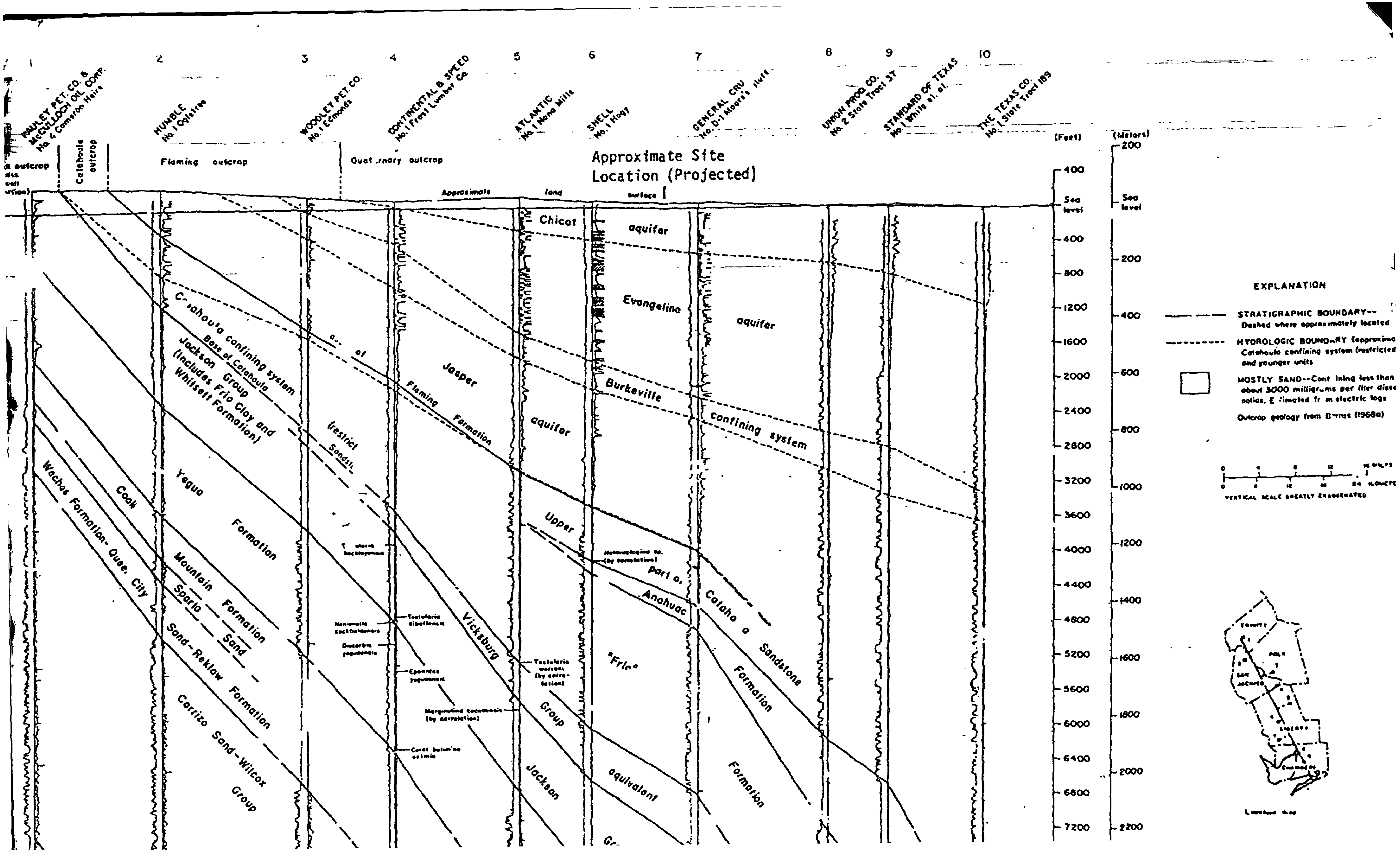
The French Limited site is in the San Jacinto alluvial valley on the east side of the river. There are remnants of Early ~~Holocene~~ 2. alluvial deposits (Deweyville Formation) at the surface (Figure 3-4) and beneath the site area. Most of the surficial deposits in ~~the site,~~ however, are later Holocene (Recent) alluvium. The alluvium has been deposited in a channel incised in the Pleistocene Beaumont Formation.

As the river meander gradually moves across the valley, it erodes older deposits on the outside of the bend and deposits predominantly sandy material on the inside of the bend (point bar deposits). Eventually, the meander doubles back on itself and the river takes a direct path, cutting off the meander which then becomes an oxbow lake. During times of flood, the lake fills with finer material (silt and clay). As the river continues to meander back and forth across the valley, the older deposits are periodically cut into and new alluvium is deposited adjacent to the old. This process has resulted in the alluvial deposits encountered at the French Limited site. Accordingly, by the nature of their deposition, the grain size of the deposits varies laterally and vertically across the site.

The river meander eroded the Beaumont Formation to depths of 20 to 55 feet in the site area. The alluvial deposits in this upper stratum are predominantly sands; however, silt and clay layers are also present.

The Holocene alluvial deposits are underlain by the Beaumont Formation which consists predominantly of clay with some discontinuous silt and sand lenses generally less than a few feet thick. At a depth of approximately 125 feet (Elevation -110), a sand stratum is present that extends to the maximum depth explored during this investigation (155 feet).

The limits of the river meander extend approximately 800 feet east of the main pit beyond which the Beaumont Formation is present at the ground surface.



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PAULEY PET. CO. & McCULLOCH OIL CORP. No. 4 Cameron Heirs
HUMBLE No. 1 Ogletree
WOOLEY PET. CO. No. 1 Edmonds
CONTINENTAL & SPEED No. 1 Frost Lumber Co.
ATLANTIC No. 1 Nona Mills
SHELL No. 1 Hogy
UNION PROD. CO. No. 2 State Tract 37
STANDARD OF TEXAS No. 1 White et. al.
THE TEXAS CO. No. 1 State Tract 189
Catahoula outcrop
Fleming outcrop
Quaternary outcrop
Approximate Site Location (Projected)
Approximate land surface
(Feet)
(Meters)
Sea level
Chicot aquifer
Evangeline aquifer
Jasper aquifer
Burkeville confining system
Base of Catahoula
Jackson Group (includes Frio Clay and Whitsett Formation)
Fleming Formation
Yegua Formation
Cook Mountain Formation
Sparta Sand
Wechas Formation-Quee. City
Sand-Reklaw Formation
Carrizo Sand-Wilcox Group
Vicksburg Group
Jackson equivalent
Upper part of Anahuac
"Frio" Formation
Catahoula Sandstone
Formation
Textularia warreni (by correlation)
Marginulina cocoaensis (by correlation)
Textularia dibollensis
Eponides yeguaensis
Nonionella cockfieldensis
Discorbis yeguaensis
EXPLANATION
STRATIGRAPHIC BOUNDARY-- Dashed where approximately located
HYDROLOGIC BOUNDARY
MOSTLY SAND
Outcrop geology from Barnes (1968a)
VERTICAL SCALE GREATLY EXAGGERATED
TRINITY
POLK
SAN JACINTO
LIBERTY
CHAMBERS

3.4 HYDROGEOLOGY

3.4.1 Regional Hydrogeology

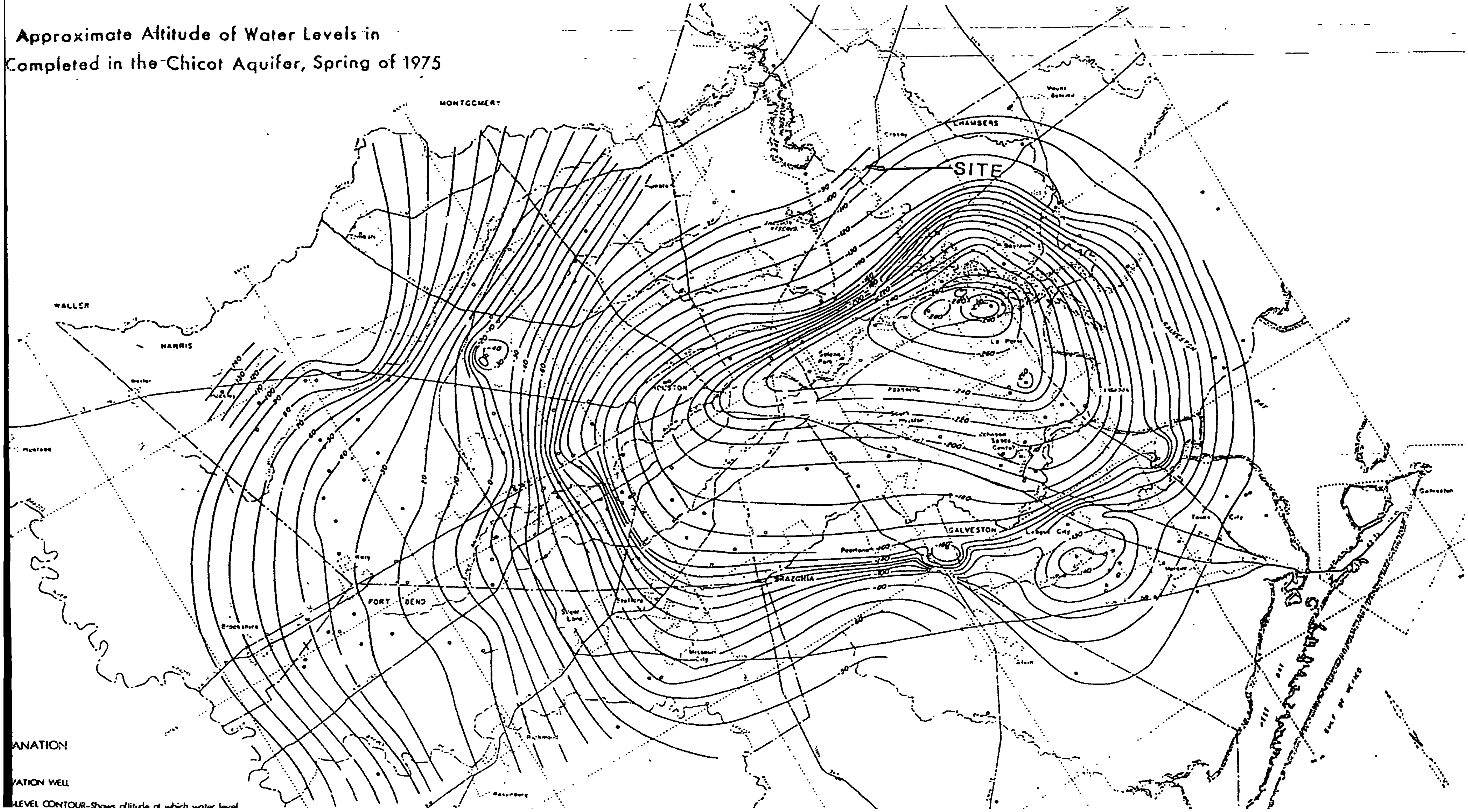
Groundwater in the Coastal Plain Region occurs under both confined and unconfined conditions. Shallow aquifers in alluvial valleys are important sources of groundwater for limited rural domestic and livestock watering purposes. Wells in these aquifers are generally less than 50 feet deep, and typically yield a few gallons per minute. Although most of these small alluvial aquifers are unconfined, near-surface impermeable material may create localized confined conditions. Recharge of the unconfined aquifers is mainly from local infiltration of rainfall, runoff, and ponded water. Deeper confined aquifers are the source of large volume, municipal and industrial groundwater supplies in the area. These include the Chicot, Evangeline, and Jasper aquifers. The Chicot and Evangeline are the major aquifers in the area and consist of interbedded sands, silt and clays.

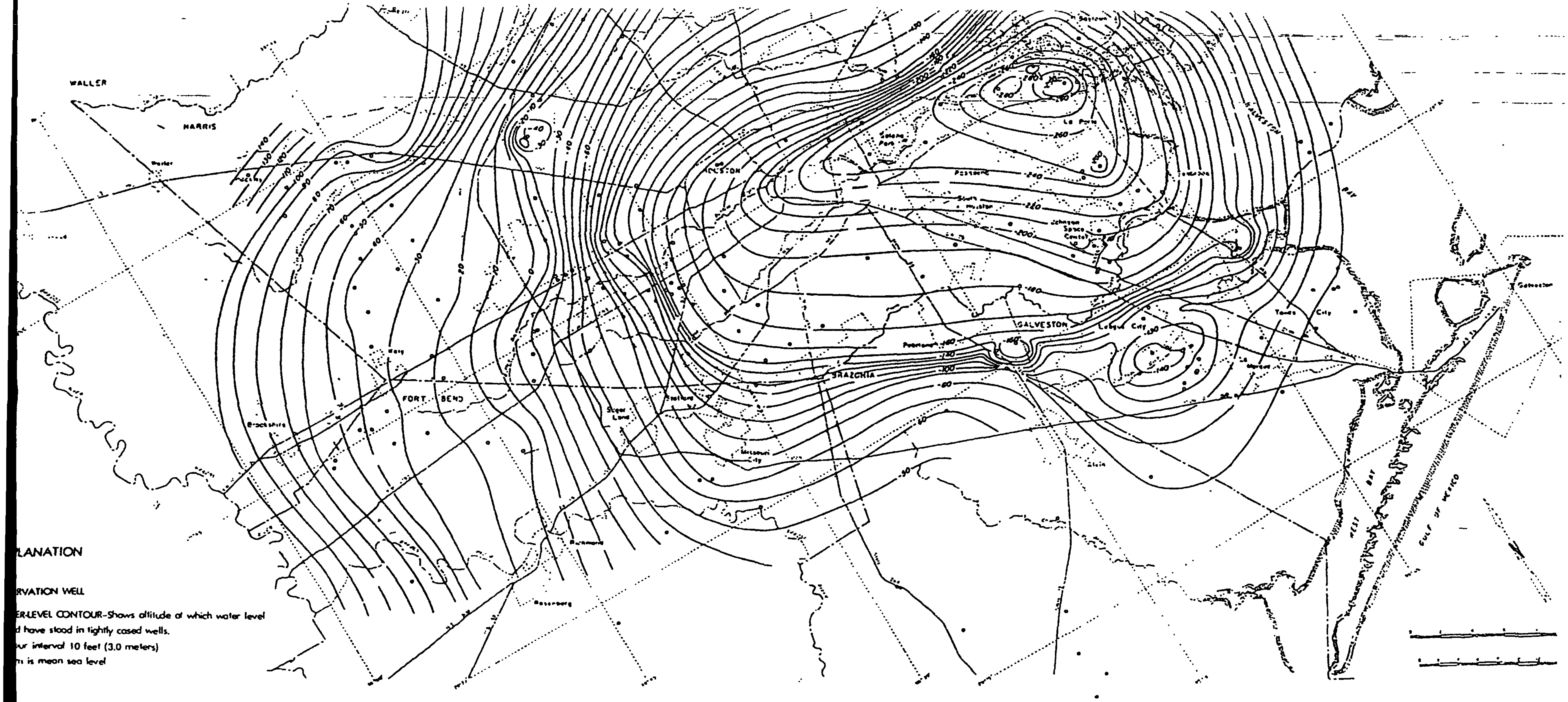
The Chicot aquifer system includes the uppermost confined aquifers in the area and generally refers to all Quaternary deposits, including the unconfined alluvial aquifers, the confining Beaumont clay, and the underlying Montgomery Formation, Bently Formation and Willis sand. The thickness of the aquifer increases toward the Gulf from zero at the western edge of the Quaternary outcrop (80 miles from the Gulf) to over 1200 feet at the Gulf (see Figure 3-4 and Plate E1). The approximate altitude of water levels in wells completed in ~~the Chicot~~ Aquifer in the Spring of 1975 is presented on Figure 3-5 and Plate E2.

The transmissivity ranges from zero to about 20,000 ft^2/day, with storage coefficients ranging from 0.0004 in the confined area of the aquifer to 0.20 in the northern, unconfined area (Jorgensen, 1975).

The Evangeline aquifer, comprised of Pleistocene deposits, immediately underlies the Chicot. It is the most important source of fresh ground water in the Houston metropolitan area. Although it has a lower hydraulic conductivity than the Chicot, the thicknesses are greater, up to about 2,000 feet near the Gulf of Mexico. The approximate altitude of water levels completed in the Evangeline aquifer in the Spring of 1975 is presented on Figure 3-6 and

Approximate Altitude of Water Levels in
Completed in the Chicot Aquifer, Spring of 1975





LANATION

RVATION WELL

ER-LEVEL CONTOUR-Shows altitude at which water level
d have stood in tightly cased wells.
ur interval 10 feet (3.0 meters)
m is mean sea level

E ELEVATION OF WATER LEVELS IN WELLS COMPLETED IN THE CHICOT AQUIFER SPRING OF 1975

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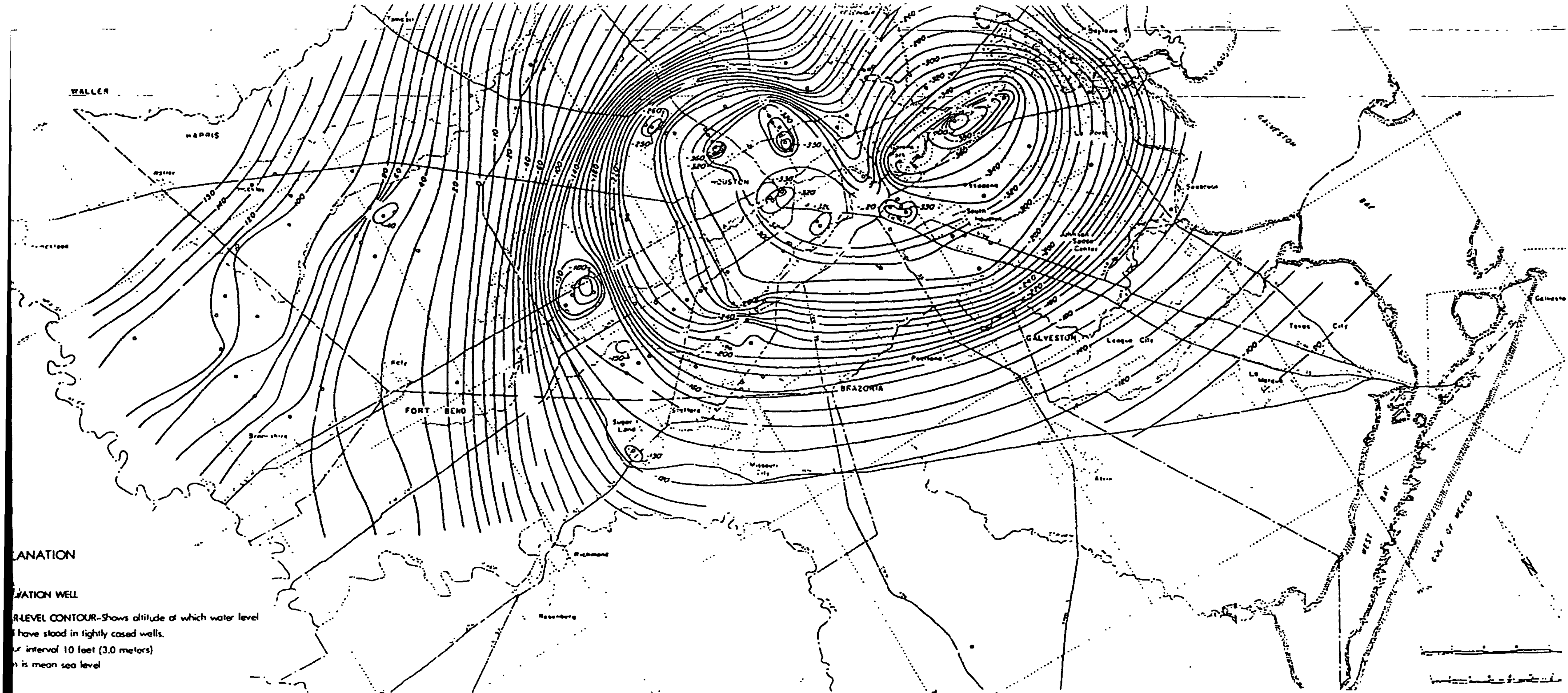

TE ELEVATION OF WATER LEVELS IN WELLS COMPLETED IN THE EVANGELINE AQUIFER SPRING 1975

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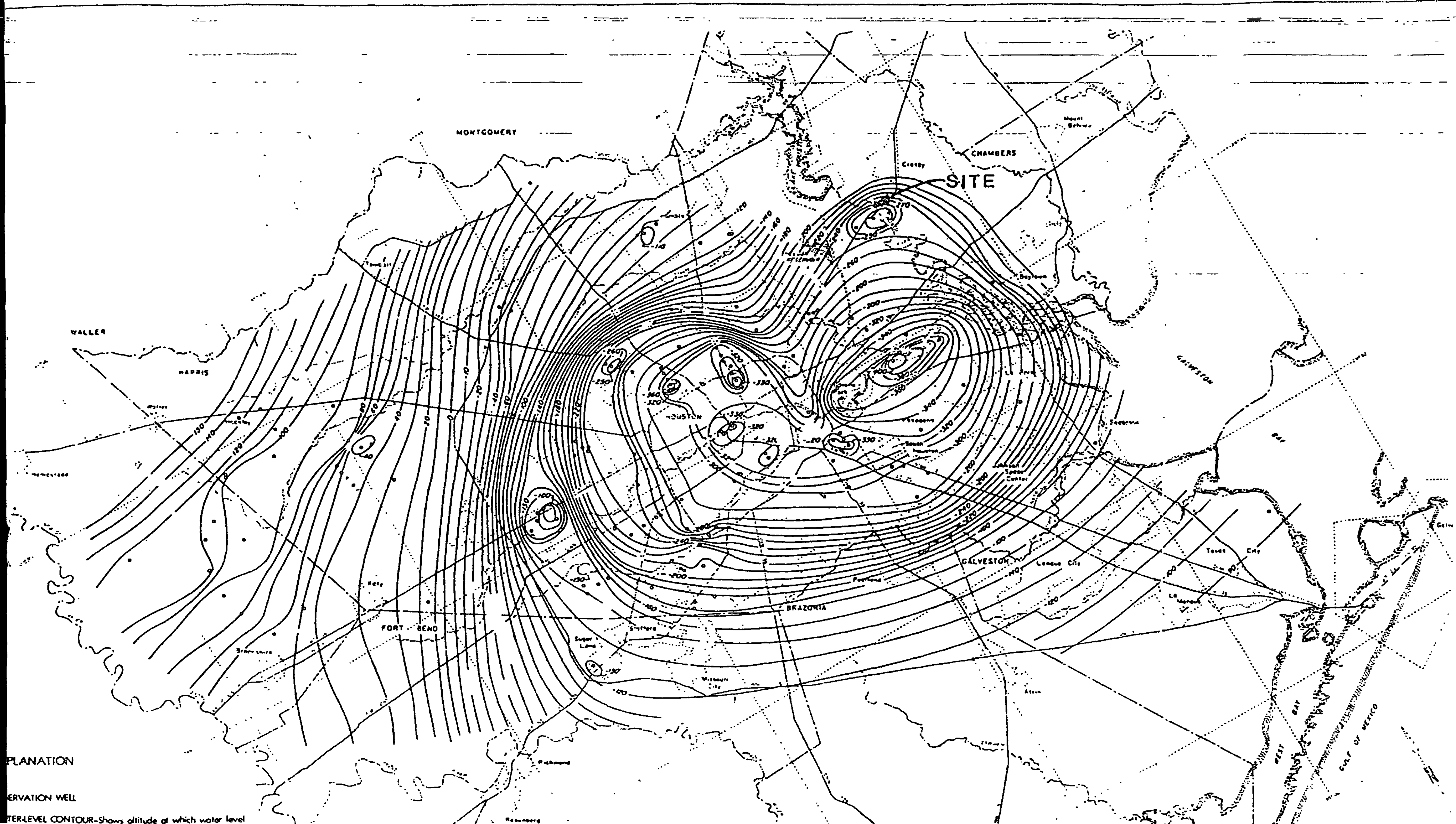

PLANATION

ERVATION WELL

TER-LEVEL CONTOUR-Shows altitude at which water level

Plate E3. The transmissivity is greater than that of the Chicot aquifer over much of the area, ranging from 5,000 ft^2/day at the north edge of the plain to 15,000 ft^2/day at the Gulf. Storage coefficients range from 0.0005 in the southern confined area to 0.20 in the northern unconfined area (Jorgensen, 1975).

The Evageline aquifer is underlain by the Burkeville confining layer of the Tertiary Flemming Formation. Below the Burkeville is the Jasper aquifer.

Groundwater withdrawal in the region dates back to about 1890. During the past century, pumping of large quantities of water has caused significant declines of up to 400 and 500 feet in the lower Chicot and Evangeline aquifers, respectively.

Recharge of the confined aquifers results primarily from direct infiltration in the aquifer outcrop areas. Only minor vertical recharge occurs through the confining beds overlying the aquifers.

wells is the Riverdale division should be included in this table

The Harris-Galveston Coastal Subsidence District identifies sixteen water wells within approximately 2 miles of the French Limited site. The well data is presented on Table 3-1 and their locations are shown on Figure 3-8. The minimum depth to the first screen interval for these wells is 200 feet. The closest major water well to the French Limited site is approximately 3,000 feet southeast of the site, and is the one mentioned earlier that is screened at 200 feet. Figures 3-5 and 3-6 show four additional wells screened from 250 to 300 feet that are immediately downgradient of the site.

3.4.2 Local Hydrogeology

Two aquifers are present within the 155-foot depth investigated for this report: the Upper Aquifer, consisting of Holocene alluvial deposits, and the Lower Aquifer consisting of a sand layer approximately 50 feet thick at a depth of approximately 125 feet. The two aquifers are hydraulically separated by approximately 75 feet of Pleistocene sediments consisting predominantly of clays. Both aquifers are considered a part of the Chicot aquifer.

Table 3-1. Area Pumping Wells

Need Water Use ie (D, I etc.)

Well No.	Owners Name	State Well No.	Latitude	Longitude	Eleva-tion	Casing Diameter	Depth to 1st Screen	Total Depth	Year Drilled	Approx. 82 Pump
3082	Vornsand Enterprises, Inc.	65-16-2 0	2952 0	95 415	45	8	0	315	1956	27925000.
1148	St. Regis Corporation-Newsprint	65-16-1 0	295213	95 544	26	24	0	1740	1966	431414286.
1144	St. Regis Corporation-Newsprint	65-16-1 0	295216	95 6 5	45	24	858	1593	1966	431414286.
2343	Harris County, M.U.D. 50	65-16-2 0	295216	95 340	47	8	264	283	1970	45196000.
2345	Harris County, M.U.D. 50	65-16-2 0	295216	95 340	47	6	261	282	1956	0.
1147	St. Regis Corporation-Newsprint	65-16-1 0	295226	95 625	46	24	818	1568	1966	431414286.
3069	Harris County, M.U.D. 50	65-16-2 0	295226	95 326	47	4	—	—	1979	0.
2344	Harris County, M.U.D. 50	65-16-2 0	295229	95 348	47	4	252	273	1953	0.
1151	St. Regis Paper Co.-Southland Division	65- 8-7 5	295237	95 629	47	8	238	330	1965	0.
2920	Harris County, M.U.D. 50	65- 8-8 0	295238	95 343	47	8	200	500	1977	45196000.
2281	St. Clair, George N.	65- 8-7 0	2953 9	95 636	25	4	—	232	1970	0.
3003	Exxon Company, U.S.A.	65- 8-8 0	295316	95 339	50	4	—	—	19 0	0.
2252	Crosby M.U.D.	65- 8-8 0	295319	95 359	47	6	—	250	1955	26425600.
3565	Crosby M.U.D.	65- 8-8 0	295319	95 359	46	10	400	500	1980	26425600.
2207	Crosby I.S.D.	65- 8-8 0	295350	95 359	49	4	348	368	1974	0.
1792	Harris County, M.U.D. 19	65- 8-815	2954 2	95 454	35	20	810	1455	1973	94365000.
	TOTAL									1559776057.

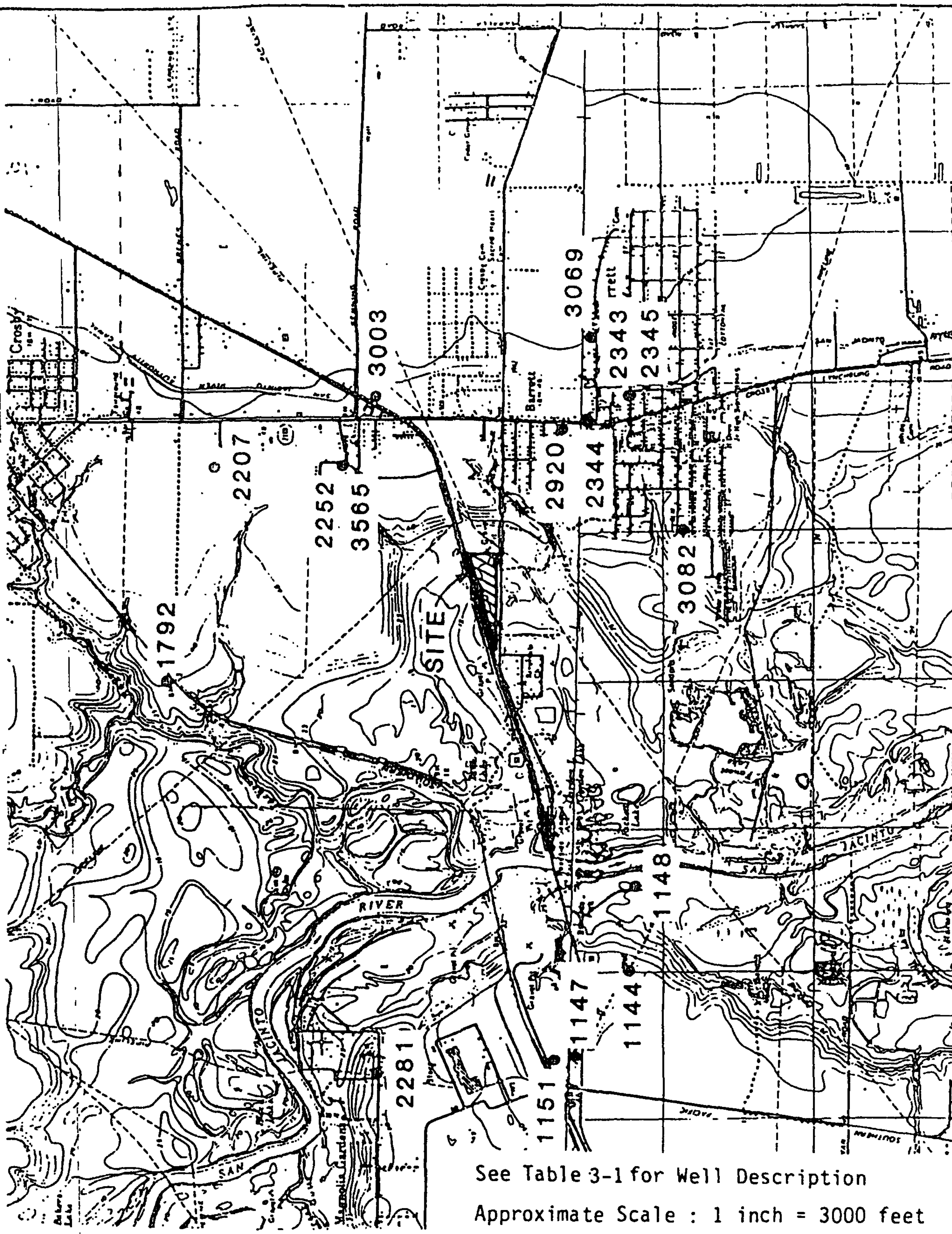

Figure 3-7
MAJOR WATER WELLS

FRENCH LIMITED SITE

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In the site area, the Upper Aquifer extends from the ground surface to a maximum depth of 55 feet (Elevation -40 feet). The San Jacinto River Valley, which contains the Upper Aquifer, is approximately 2.5 miles wide in the site vicinity. The alluvial deposits consist primarily of fine to medium sands; however, discontinuous silt and clay layers are also present. Because of these discontinuous silt and clay layers, the Upper Aquifer, which is generally unconfined, may have localized areas where confined conditions exists.

Groundwater levels in the Upper Aquifer in the site area are generally at/or near the ground surface with elevations ranging from approximately 7 to 14 feet. In several areas, the groundwater level coincides with the water level in the numerous ponds, pits and marshes in the areas. Based on water levels recorded in monitoring wells at the site during 1983 and 1984, the groundwater level is relatively constant with fluctuations of only a few feet.

The hydraulic gradient in the Upper Aquifer in the site area is relatively flat, on the order of 0.001 feet/feet to the north and southwest. Locally, the gradient will be higher over short distances, particularly when there are abrupt changes in the elevation of the ground surface, such as the sand pits, hillsides and creeks. The largest hydraulic gradient observed is between the main pit and the slough to the north, which is on the order of 0.06 feet/feet.

The Lower Aquifer is under artesian conditions with a piezometric surface at approximately Elevation -67 feet. This level is approximately 81 feet below the ground surface and 46 feet above the top of the Lower Aquifer. Based on the thickness of the clay separating the two aquifers and the large difference in water levels, it appears that the two aquifers are hydraulically separated. The gradient appears to be on the order of 0.001 feet/feet toward the south.

Beneath the site, the remainder of the Chicot aquifer is about 400 feet thick, extending to approximately Elevation -500 feet and displays an average transmissivity of about 3,300 ft^2/day (Jorgensen, 1975). The piezometric surface of the confined unit near the base of the aquifer beneath the site was about 100 feet below mean sea level in 1975 (see Plate E2).

The Evangeline aquifer is about 1,500 feet thick beneath the site, with a transmissivity of about 8,000 ft^2/day. The piezometric surface beneath the site area was about Elevation -250 feet in 1975 (see Plate E3).

Piezometric levels in the deep confined aquifers beneath the site declined about 150 feet in the Chicot and 250 feet in the Evangeline between 1890 and 1970 (Jorgensen, 1975).

3.5 SURFACE WATER

The French Limited site experiences approximately 50 inches of rain per year, with the greatest seasonal rainfall occurring during the summer months. Precipitation only slightly exceeds evaporation.

The general surface water flow pattern in the area is southwest toward the San Jacinto River. The drainage of the site and adjacent areas is poor and generally dominated by man-made features such as roads, ditches, culverts, berms, pits, and garbage dumps or fill areas. The main waste pit and the east pit (see Figure 3-8) are bermed with no regularly flowing outlet. The main waste pit, however, does have an overflow which discharges directly into the fishing hole under U.S. Highway 90. The overflow was installed to prevent overtopping of the berms around the pit during heavy rains, and only flows under those conditions.

Not shown on Diagram

The fishing hole beneath the U.S. Highway 90 bridge drains northward and then to the west along the north side of U.S. Highway 90. Flow passes through a series of marshes and culverts, just north of U.S. Highway 90, eventually reaching the San Jacinto River some 6,000 feet to the west. The marsh area east of the French Limited main pit is also in this drainage area. Much of the Sikes Disposal Pits site also drains into this same watershed.

This channel should be shown on Fig-3-8

NOT shown

The abandoned sand pit south of the site drains into a channel which enters Rickett Lake some 4,800 feet to the southwest. Rickett Lake is shown in Figure 3-2. The creek is the main natural drainageway for the area and likely influences the near-surface groundwater flow pattern.

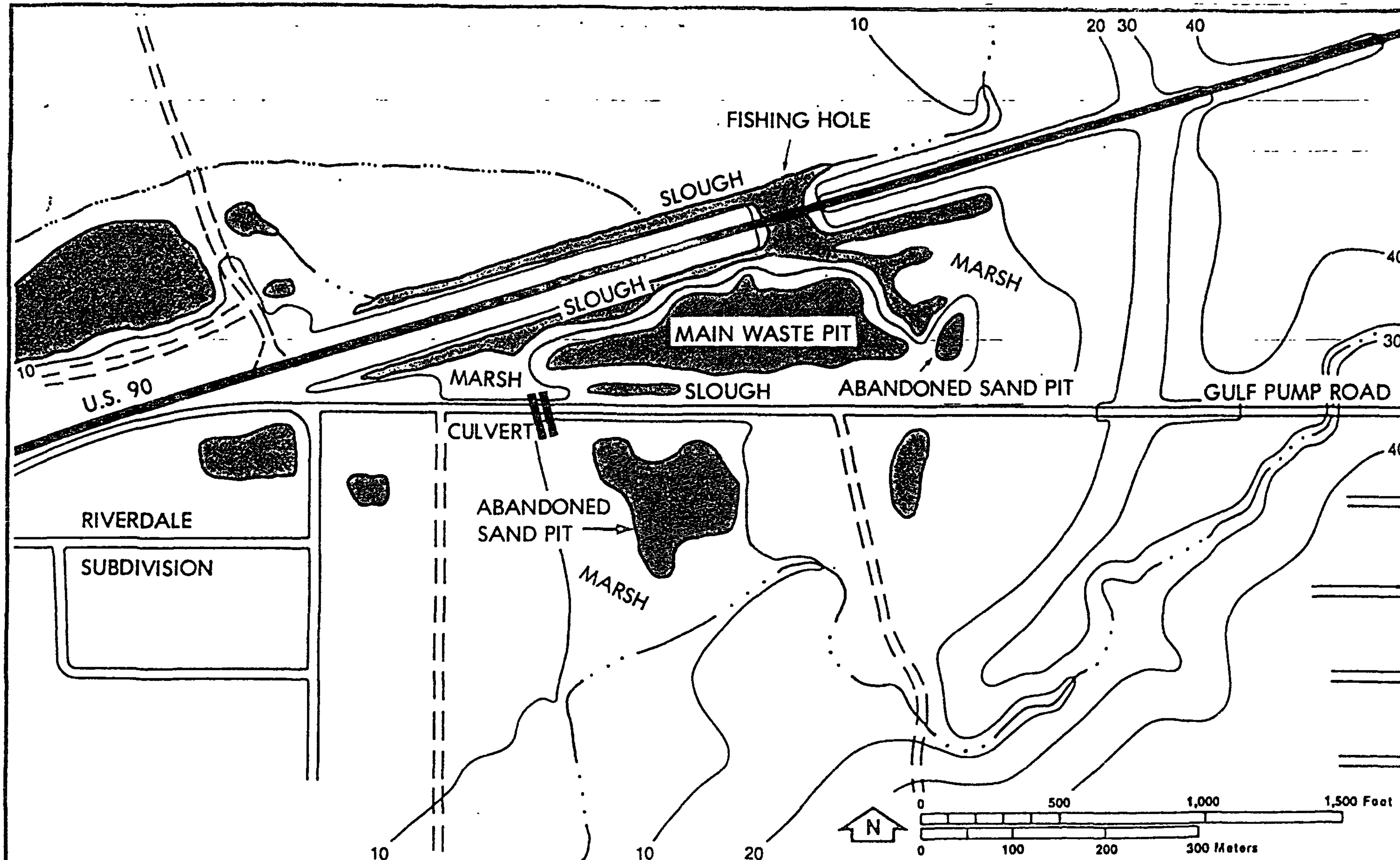

Figure 3-8
SURFACE WATER FEATURES

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The San Jacinto River south of the Lake Houston Dam is under the tidal influences from Galveston Bay. This reach of the river is designated for contact and noncontact water-oriented recreation, as well as the propagation of fish and wildlife. This reach is not used as a domestic water supply (Texas Surface Water Quality Standards, amended 1981).

The flood of May 22-24, 1983 afforded the opportunity to view the site during flooding conditions. Figure 3-9 shows the flow patterns observed the afternoon of May 23 and morning of May 24. The flood peaked the evening of May 23 and was approximately 2 feet above the berm (16 feet above msl) surrounding the main waste pit at that time. The 100-year flood elevation in the French Limited site vicinity is 28 feet above msl. don't think is correct.

In addition to the May 1983 event the site has flooded in 1969, 1973, and 1979. The potential for waste and contaminated surface water transport during flood events is great. During and shortly after the active years of this site's operation, the contaminant migration caused by flooding was likely greater due to higher suspended solids, more liquid wastes, large amounts of floating sludges and higher waste concentrations in the main waste pit waters. Past flood events have regularly flooded the residences in the Riverdale Subdivision. At this time, the subdivision does not appear to be immediately downstream of the French Limited site, but area residents report that after several of the past floods sludges were transported into the subdivision and remained when the flood waters receded. During the May 1983 flood, small quantities of the floating oily residue were transported southward across Gulf Pump Road.

3.6 AREA LAND USE/POPULATION

The French Limited site is approximately one mile south of Crosby, Texas and one-half mile east of Barrett, Texas. The combined population of the Crosby/Barrett area is approximately 5,250 based on the 1980 census. The two towns serve as small communities to the greater Houston area, with many of the inhabitants working for the industries around the Houston Ship Channel.

The Crosby/Barrett area is primarily residential with some commercial businesses and some sand mining operations along the San Jacinto River and its

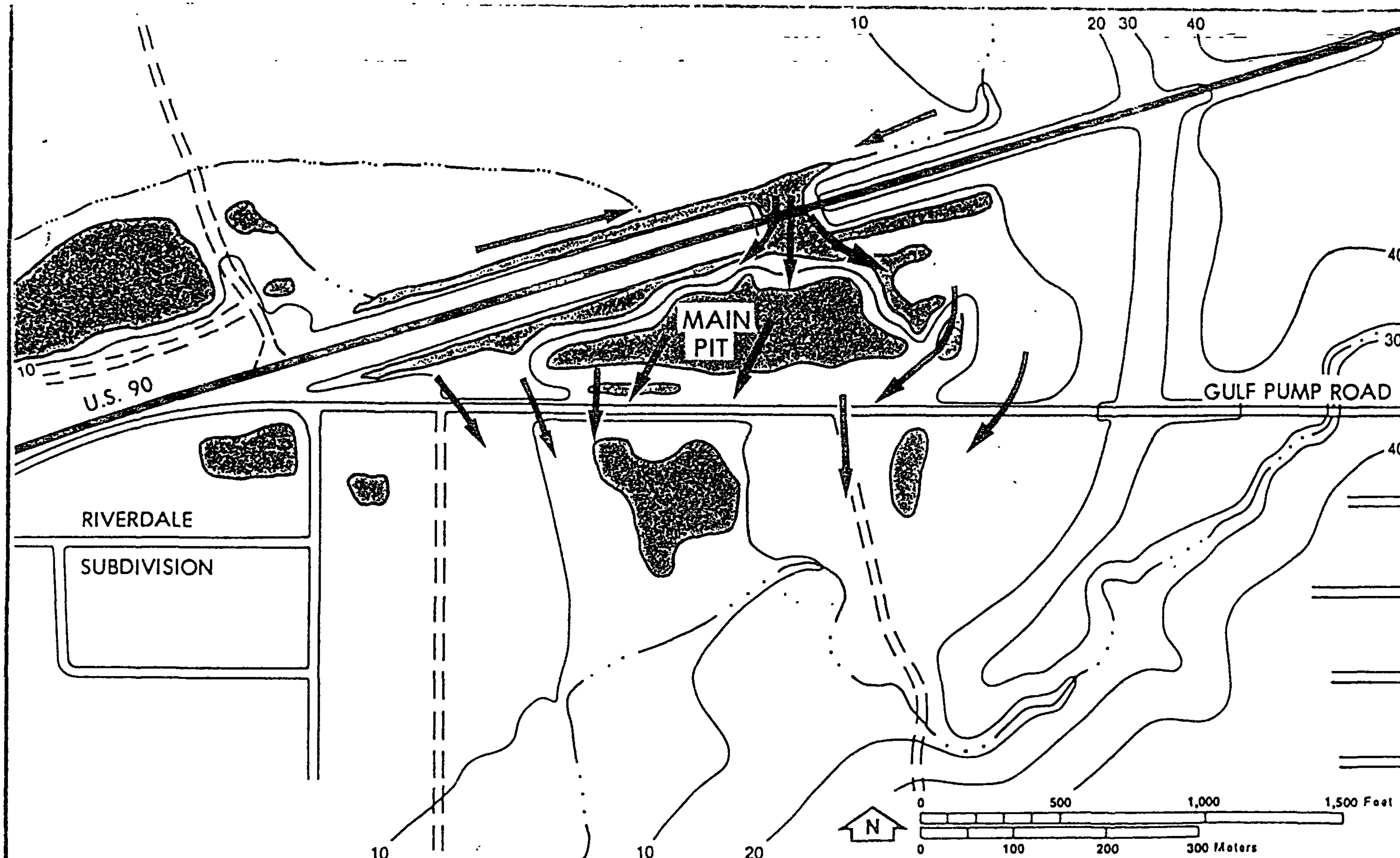

Figure 3-9
FLOOD FLOW PATTERNS
MAY 23-24, 1983

FRENCH LIMITED SITE

Prepared for:
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tributaries. Some farming also occurs in the outlying areas. Approximately two miles west of the site, on the western bank of the San Jacinto River, St. Regis operates a pulp/paper mill.

The area around the French Limited site is primarily undeveloped, densely wooded land with large intermittent swampy areas. The area contains many abandoned sand pits which are frequented by area sport fishermen. Southwest of the site is the Riverdale Subdivision (see Figure 3-1) with a residential population of less than a hundred people. Adjacent to the subdivision is an active pipe storage yard, on land that was a landfill operated by Harris County in the late 1960's. Gulf Pump Road which borders the site on the south shows evidence of illegal garbage dumping along the roadside ditches.

Approximately one mile west of the site along the San Jacinto River and one-half mile north of the site along Jackson Bayou are numerous active sand mining operations.

4.0 FIELD ACTIVITIES

4.1 SOIL BORINGS

4.1.1 Selection of Borings and Well Locations

This section presents data for borings and wells installed during three field investigations. During the investigations, twelve soil borings (borings with soil sampling) were drilled and twenty groundwater monitoring wells were installed. The borings ranged in depth from 20 to 155 feet. Two privately owned wells and two wells installed by TDWR were also included in the monitoring program. The location of the borings and wells are presented in Table 4-1, on Figure 4-1 and on Plate B-1.

4.1.2 Drilling and Soil Sampling Methods

The borings were drilled utilizing truck and swamp buggy-mounted rotary wash drilling equipment using water obtained from a Harris County MUD50 fire hydrant. Small amounts of drilling fluid additives (non-organic bentonite derivatives) were used in boring BO02/GW02, BO03/GW03, BO05/GW05 and GW12 through GW25 to prevent the borings from collapsing.

Borings BO01 through BO12 were logged during the drilling operations, and samples of the subsurface soils were obtained for visual classification and laboratory testing. Soil samples were taken at 5-foot intervals to a depth of 100 feet and at 10-foot intervals thereafter. In boring GW12, samples were taken at 10-foot intervals for the depth of the boring. Soil samples were obtained using a Shelby Tube sampler and various split spoon samplers. The samplers and sampling methods are described on Plate B5 in Appendix B. Wells GW11, and GW13 through GW22 were logged from cuttings and drilling rates attained during the drilling process.

Soils were classified in accordance with the Unified Soil Classification System presented on Plate B5. A graphical representation of the subsurface strata encountered in each boring is presented on the Log of Borings in Appendix B.

To aid in identifying contaminated soil samples, a photoionization detection (PID) meter was used during the drilling of BO01 through BO11. The meter

Give depths in table

Table 4-1. Boring/Well Location and Site Selection Rationale

Boring/Well Number	Location/Rationale
April 1983	
B001/GW01	Background shallow boring/well upgradient (east) of French Limited.
B002/GW02	Deep boring/well south of Gulf Pump Road, downgradient of French Limited.
B003/GW03	Shallow boring/well south of Gulf Pump Road, downgradient of French Limited, east of GW02.
B004/GW04	Shallow boring/well potentially downgradient from French Limited.
B005/GW05	Shallow boring/well north of U.S. ~~Highway 90,~~ northwest of French Limited, potentially downgradient. ?
B006/GW06	Deep boring/well adjacent to existing EPA well (GW08) southeast of main lagoon.
B007 B008 B009	Shallow borings to clay stratum along southern French Limited boundary to define soil characteristics along potential slurry wall alignment.
B010 B011	Shallow borings to clay stratum along eastern boundary to define soils along potential slurry wall alignment.
GW07	Shallow well adjacent to deep well GW02, forming a piezometer cluster potentially downgradient of French Limited and upgradient of Riverdale Subdivision.
GW08	Existing TDWR well southeast of main lagoon.
GW09	Existing TDWR well southwest of main lagoon.
GW10	Groundwater sample from shallow residence well in southern half of Riverdale.
GW11	Groundwater sample from shallow residence well in northern half of Riverdale. This well does not appear to be in the Riverdale Sub division.

can't be downgradient in both case unless ground [illegible] radially [illegible]

Table 4-1. Boring/Well Location and Site Selection Rationale (Continued, Page 2 of 3)

Boring/Well Number	Location/Rationale
<u>November 1983</u>	
B012/GW12	Deep boring/well north of U.S. Highway 90 and the main lagoon.
GW13	Shallow well downgradient of French Limited site forming a piezometer cluster with GW12.
GW14	Shallow well north of U.S. Highway 90 and main lagoon, potentially downgradient.
GW15	Shallow well north of U.S. Highway 90 and main lagoon, potentially downgradient.
GW16	Shallow well north of U.S. Highway 90 and main lagoon, potentially downgradient.
GW17	Shallow well south of U.S. Highway 90 and west of main lagoon.
GW18	Shallow well in northern section of Riverdale Subdivision to check for local cone of depression.
GW19	Shallow well east of Riverdale Subdivision and south of Gulf Pump Road.
GW20	Shallow well south of Gulf Pump Road, downgradient of main lagoon.
GW21	Shallow well south of Gulf Pump Road, downgradient of main lagoon.
GW22	Shallow well south of Gulf Pump Road, downgradient of main pit.
LG-1 thru LG-6	~~Staff gauges were installed~~ to measure water levels in six ponds on the site.

Change wording incorrect. There are no 6 ponds on the French Site.

Table 4-1. Boring/Well Location and Site Selection Rationale (Continued, Page 3 of 3)

Boring/Well Number	Location/Rationale
April 1984	
GW23	Shallow well at southwest corner of landfill.
GW24	Shallow well south of landfill.
GW25	Deep well south of main pit replacing GW06.

Note: BO -- indicates soil boring with soil sampling.
GW -- indicates groundwater monitoring well.
BO/GW -- indicates soil boring converted to monitoring well.
LG -- indicates staff gauge in ponds.

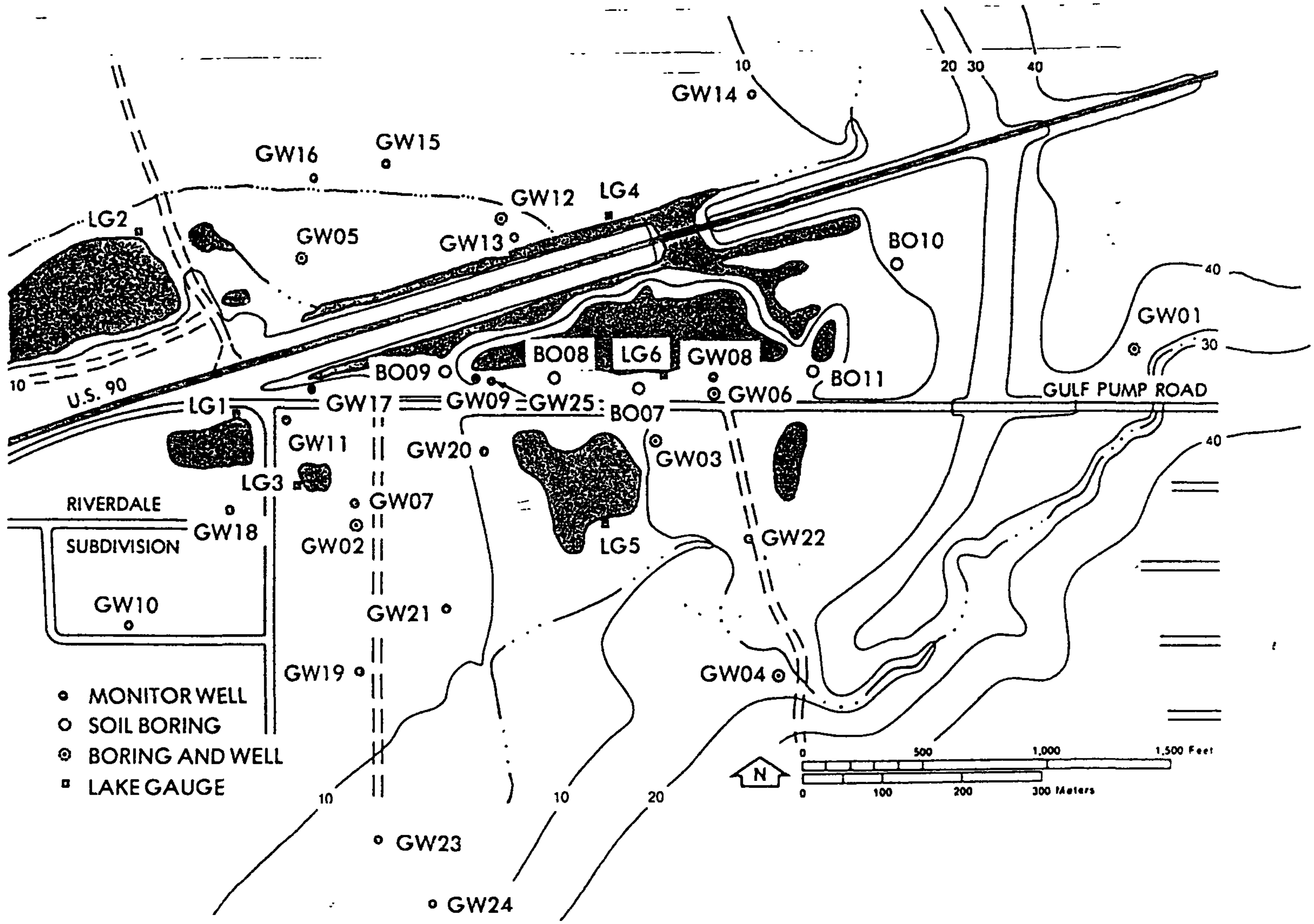

Figure 4-1
SOIL BORING/MONITOR WELL LOCATIONS

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detects volatized organics and is sensitive to less than one-half part per million (ppm). The meter was used in place of the pH and specific conductance tests originally proposed in the Work Plan. The PID readings are presented in Appendix B on the Log of Borings. Contaminated soils showed high readings; however, not all readings were indicative of contamination. Based on visual observations, odors, and PID readings contaminated soil samples were found only in borings immediately around the the main waste pit and in boring B011 approximately 100 feet to the southeast of the main waste pit.

explain

Borehole geophysical logs were run on borings B001 through B011, excluding B005 and B010, when the borings were completed to their full depth. The boring was then either converted to a groundwater monitoring well, as described in Section 4.2, or sealed to the ground surface with a cement/bentonite grout. Soil cuttings from the borings were placed in containers, and dumped into the main waste pit so as to prevent possible surface contamination outside the immediate site area.

4.1.3 Borehole Geophysical Logging

The purpose of the geophysical logging was to provide a continuous profile of the subsurface strata, to complement the soil boring logs and to identify possible thin sand and clay lenses that might be missed during the drilling operations. Logging was done using Logmaster equipment. A brief description of each type of log and its interpretation is presented in the following paragraphs.

A resistivity and self-potential log was run in the 4-inch diameter borings prior to reaming or grouting the boring. Boring B005 and B010 were not logged because they were inaccessible to the equipment. Boring B003/GW03 was logged using a natural gamma and a gamma-gamma density probe after the well was installed. To aid in the interpretation of the logs the soil log is presented on the left side of each plate.

The logs showed occasional thin sand lenses in the deeper clay layers particularly in borings B002/GW02 and B006/GW06. It should also be noted that in boring B008 and B009 (near the main waste pit) the Single Point Resistance in the sands is lower than would be expected. This is possibly caused by the presence of inorganic contaminants, or ionizable inorganic compounds.

Single Point Resistance--Single Point Resistence is a measure of the ability of a soil formation to conduct electric current through fluid-saturated pore spaces (resistivity is the inverse of conductivity). At a given temperature, the resistivity of a formation is a function of the geometry of interconnected pore spaces, the percentage of fluid saturation, and ion concentration of the pore fluid. Clay-dominated formations have low resistivities because pore waters are subject to desorption of exchangeable ions from clay minerals. These ions increase the conductivity of the pore water and thereby reduce the resistivity of the formation. Sand dominated formations generally have high resistivities in cases where (1) the sand is "clean" (i.e., essentially free of clay); (2) the pore fluid is "fresh" (i.e., low salinity), and (3) the porosity is low. The magnitudes of resistivities for sand formations are greatly reduced by the introduction of even a small fraction of clay (less than one percent of the total volume). Increasing either the porosity or the salinity of the pore water also lowers the formation resistivity.

Self-Potential--The borehole self-potential log is a measure of natural direct current (DC) voltages that are generated within the borehole. Electrochemical potentials are produced when there is a difference in ionic concentration between the borehole fluid and the formation water. In a permeable formation, a potential forms where the borehole fluid and formation water come in contact. The differences in ion mobilities within the two solutions cause an electrical charge imbalance at the contact, and this imbalance produces a potential that is known as the liquid junction potential. In addition, a potential is formed across a clay-sand boundary. The clay acts as a selective membrane, rejecting anions but allowing cations to diffuse. The resulting charge imbalance at the boundary is known as the membrane potential. These two potentials are additive. When the borehole fluid is less saline than the formation water, a negative potential is measured opposite a porous sand or gravel bed. A positive potential can result when the borehole fluid is more saline than the formation water. Potentials measured opposite clays serve as a baseline for self-potential deflections.

Natural Gamma--This log measures the natural radioactivity of the formations encountered in the borehole. Gamma radiation occurs in the high energy range of the electromagnetic spectrum. Nearly all gamma radiation is emitted from the unstable isotope potassium 40 which tends to concentrate in clay minerals. Interpretation of gamma intensity in terms of clay content is qualitative; a high gamma intensity (counts per second) indicates high clay content (clay-rich soil), and low gamma intensity indicates low clay content (suggesting a sandy soil).

Gamma-Gamma Density--The gamma-gamma density logging utilizes a probe containing an element of 125 m/c of Cesium 137 at the bottom of the probe and sodium iodide crystal detectors 8.125 inches above the source. Sands adsorbs more energy than clays and therefore show a lower radiation count. On the E-logs graph, the plot was reversed so as to have the same direction as the natural gamma readings (see Plate B-11, Appendix B).

4.1.4 Physical Soil Analysis

Soil samples from the borings were taken to HLA's Houston laboratory for selected testing and storage. Laboratory tests were performed in order to evaluate the physical properties of the site soils for use in contaminant transport modeling and analysis as well as for correlation with field tests. The tests performed and the standards used are presented in Table 4-2.

The test results are also presented on the boring logs and in Appendix C as described on Plate C1. Particle size analyses are presented on Plates C2 through C12. The grain size distribution range for the clean sands and silty sands/sandy silts are presented on Plates C2 and C3, respectively. The percent passing the No. 200 sieve (silt fraction) is also presented on the boring logs.

The Atterberg Limits (Liquid Limit and Plasticity Index) are presented on Plasticity Charts, Plates C13 through C15, as well as on the boring logs. Specific gravity and laboratory permeability results are presented on the boring logs. The results of the laboratory tests for each Formation are summarized on Tables 4-3, 4-4 and 4-5.

Tables 4-3 through 4-5 presents the laboratory data on the alluvium. The alluvium consists of clean sands, silty sands, sandy silts and clays. The sands are medium dense; their moisture contents vary between 11 and 19 percent

Table 4-2. Physical Tests and Standards

Test	Standard
Moisture Content/Dry Density	ASTM* D-2216
Particle Size Analysis	ASTM D-422
Specific Gravity	ASTM D-854
Liquid Limit	ASTM D-423
Plastic Limit	ASTM D-424
Falling Head Permeability	Corps of Engineers EM-1110-2-1906

* American Society of Testing and Materials.

Table 4-3. Physical Tests on Clean Sands (SP or SP-SM)

Boring Number	Elevation (ft. msl)	Soil Classification	Moisture Content (%)	Dry Density (lb/cf)	Particle Size Analysis (percent finer)				K (cm/sec)	Specific Gravity (g/cc)
					#10	#40	#100	#200		
B003/GW03	5.2	SP	--	--	98	73	8	5	--	2.65
B003/GW03	0.2	SP	--	--	--	--	--	--	$4.0x10^{-3}$	--
B003/GW03	-9.8	SP	--	--	88	49	6	3	--	--
B005/GW05	9.6	SP-SM	19.1	116	99	76	21	9	$1.7x10^{-3}$	--
B005/GW05	-5.4	SP	--	--	96	63	6	2	--	--
B007	3.0	SP	--	--	--	--	--	--	$8.0x10^{-3}$	--
B007	-2.0	SP	--	--	88	46	6	4	--	2.65
B007	-12.0	SP	--	--	91	65	5	3	--	--
B011	1.1	SP	--	--	93	50	5	4	--	--
LOW			19.1	116	88	46	5	2	$1.7x10^{-3}$	2.65
HIGH			19.1	116	99	76	21	9	$8.0x10^{-3}$	2.65

Table 4-4. Physical Tests on Silty Sands (SM) and Sandy Silts (ML)

Boring Number	Elevation (ft. msl)	Soil Classification	Moisture Content (%)	Dry Density (lb/cf)	Atterberg Limits		Particle Size Analysis (percent finer)				K (cm/sec)	Specific Gravity (g/cc)
					LL	PL	#10	#40	#100	#200		
B001/GW02	29.3	SM	11.7	97	--	--	100	100	99	47	--	--
B002/GW02	4.6	SM	--	--	--	--	100	99	78	46	--	--
B002/GW02	-30.4	ML	--	--	--	--	100	100	92	51	--	2.66
B002/GW02	-35.4	ML	--	--	--	--	100	100	78	37	1.2×10^{-6}	--
B003/GW03	-19.8	ML	15.3	112	--	--	--	--	--	--	--	--
B003/GW03	-24.8	ML	19.0	101	--	--	--	--	--	--	--	--
B003/GW03	-34.8	ML	17.0	109	--	--	--	--	--	--	--	--
B004/GW04	-16.2	ML	--	--	--	--	100	100	100	96	--	--
B006/GW06	-29.1	ML	--	--	--	--	100	100	96	59	2.7×10^{-3}	--
B006/GW06	-79.1	ML	--	--	--	--	100	100	100	87	--	--
B006/GW06	-129.1	SM	--	--	--	--	100	98	42	15	--	2.67
B008	7.9	SM	--	--	--	--	100	77	33	20	--	2.66
B008	-17.9	ML	--	--	--	--	100	100	97	70	--	2.65
B009	7.1	SM	--	--	--	--	89	58	37	34	--	--
B009	2.9	SM	--	--	--	--	100	100	66	24	--	2.59
B009	-22.1	SM	--	--	--	--	100	99	62	12	--	--
B010	2.1	ML	--	--	Non-Plastic		100	100	89	65	--	--
B010	-7.9	SM	--	--	--	--	100	99	57	19	2.2×10^{-5}	--
LOW			11.7	97	--	--	89	77	33	12	1.2×10^{-6}	2.59
HIGH			19.0	112	--	--	100	100	100	96	2.7×10^{-3}	2.67
AVERAGE			15.8	105	--	--	--	--	--	--	--	--

Table 4-5. Physical Tests on Clays (CH and CL)

Boring Number	Elevation (ft. msl)	Soil Classification	Moisture Content (%)	Dry Density (lb/cf)	Atterberg Limits		Particle Size Analysis (percent finer)				Permeability K (cm/sec)	Specific Gravity (g/cc)
					LL	PL	#10	#40	#100	#200		
B002/GW02	-5.40	CL	14.5	114	35	17	--	--	--	--	--	--
B002/GW02	-15.40	CH	24.1	96	69	32	--	--	--	--	--	--
B002/GW02	-25.4	CH	19.2	107	--	--	--	--	--	--	--	--
B002/GW02	-40.4	CH	21.6	98	56	27	--	--	--	--	--	--
B002/GW02	-45.4	CH	22.9	96	--	--	--	--	--	--	--	--
B003/GW03	-39.8	CH	26.7	92	--	--	--	--	--	--	--	--
B004/GW04	3.8	CH	18.1	108	--	--	--	--	--	--	--	--
B004/GW04	-6.2	CH	14.8	112	--	--	--	--	--	--	--	--
B004/G004	-11.2	CL	16.8	111	33	17	--	--	--	--	3.5×10^{-6}	--
B005/GW05	-15.4	CL	16.3	104	--	--	100	100	97.2	72.6	9.6×10^{-5}	--
B006/GW06	-10.9	CH	20.1	97	--	--	--	--	--	--	--	--
B006/GW06	5.9	CH	21.3	100	--	--	--	--	--	--	--	--
B006/GW06	-14.1	CH	34.9	91	--	--	--	--	--	--	--	--
B006/GW06	-34.1	CH	27.9	94	55	24	--	--	--	--	--	--
B006/GW06	-44.1	CH	31.3	89	--	--	--	--	--	--	--	--
B006/GW06	-59.1	CH	23.0	101	56	24	--	--	--	--	--	--
B006/GW06	-69.1	CH	23.2	99	--	--	--	--	--	--	--	--
B006/GW06	-89.1	CL	30.2	91	48	20	--	--	--	--	--	--
B007	-17.0	CL	19.3	106	--	--	--	--	--	--	--	--
B007	-27.0	CL	18.8	106	--	--	100	100	94.9	57.2	6.6×10^{-5}	--
B007	-32.0	CH	33.2	86	76	25	--	--	--	--	--	--
B008	-27.1	CL	17.5	117	29	19	--	--	--	--	7.0×10^{-8}	--
B009	15.9	CL	23.7	90	46	19	--	--	--	--	--	--
B009	-42.1	CL	32.2	92	42	20	--	--	--	--	2.5×10^{-7}	--
B010	-17.9	CH	30.6	90	65	22	--	--	--	--	--	--
LOW			14.5	86	29	17	100	100	94.9	72.6	7.0×10^{-8}	--
HIGH			34.9	117	76	32	100	100	97.2	57.2	9.6×10^{-5}	--
AVERAGE			24.7	101.5	52.5	24.5	--	--	--	--	--	--

and their dry density between 97 and 116 pounds per cubic foot (pcf). The sands are generally fine to medium grained and remolded permeability tests show vertical permeabilities on the order of 10^{-3} cm/sec. The alluvial clays are stiff to very stiff and have moisture contents that varied from 14 to 35 percent. The dry densities ranged from 90 to 114 pcf. The measured vertical permeability of clay ranged from 10^{-4} to 10^{-6} cm/sec.

The Beaumount clays are very stiff to hard with moisture contents between 17 and 33 percent, and dry densities between 89 and 107 percent. The clays are highly plastic with measured vertical laboratory permeabilities on the order of 10^{-7} cm/sec.

which boring number on Table 4-5 with permeabilities associated with them are from the Beaumont clay.

The Lower Aquifer at a depth of approximately 125 feet consists of a very dense, fine-grained silty sand. Permeabilities in this layer are estimated to be on the order of 10^{-3} cm/sec.

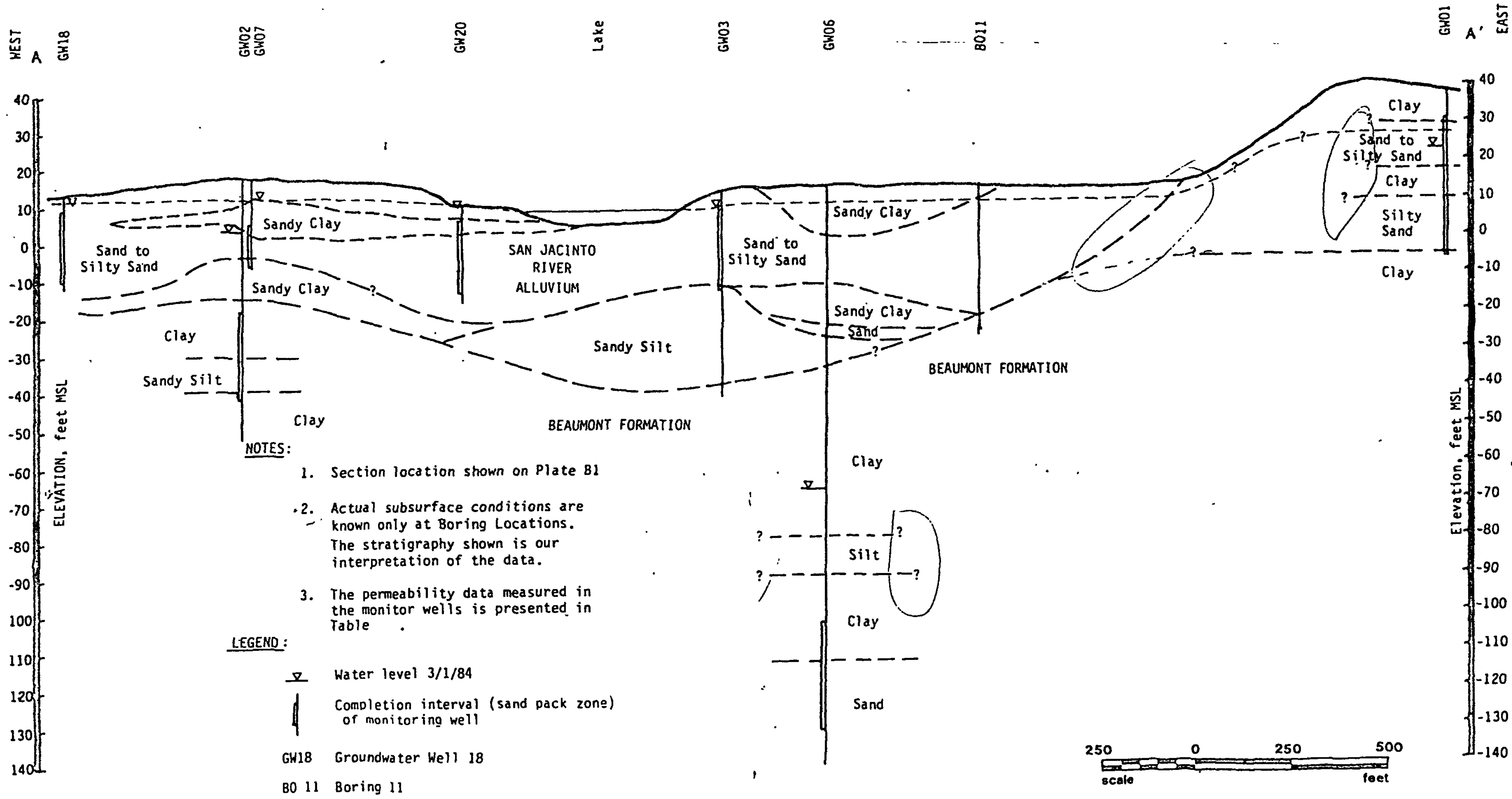
4.1.5 Assessment

Based on the exploration borings, geophysical logs and physical soil tests, the subsurface soils are interpreted as follows. Within the site area and depth of interest to the project, there are two types of soil deposits; the relatively permeable San Jacinto River alluvium and the underlying relatively impermeable Pleistocene deposits. The vertical and lateral extent of the alluvium in the site is shown on the subsurface profile presented on Figures 4-2 and 4-3 (also see Plates B-3 and B-4). The location of these profiles is shown on Figure 4-4 (also see Plate B1).

The meandering San Jacinto River eroded the underlying Pleistocene clay soils to depths of 20 to 55 feet in the site area. During the erosion process, the river is also filling the eroded valley with point bar, channel and overbank deposits.

As a result of this depositional environment, the alluvium may be characterized as follows:

1. The alluvium consists predominantly of sand, with some silt and clay layers which have been deposited during different stages of flow from San Jacinto River;



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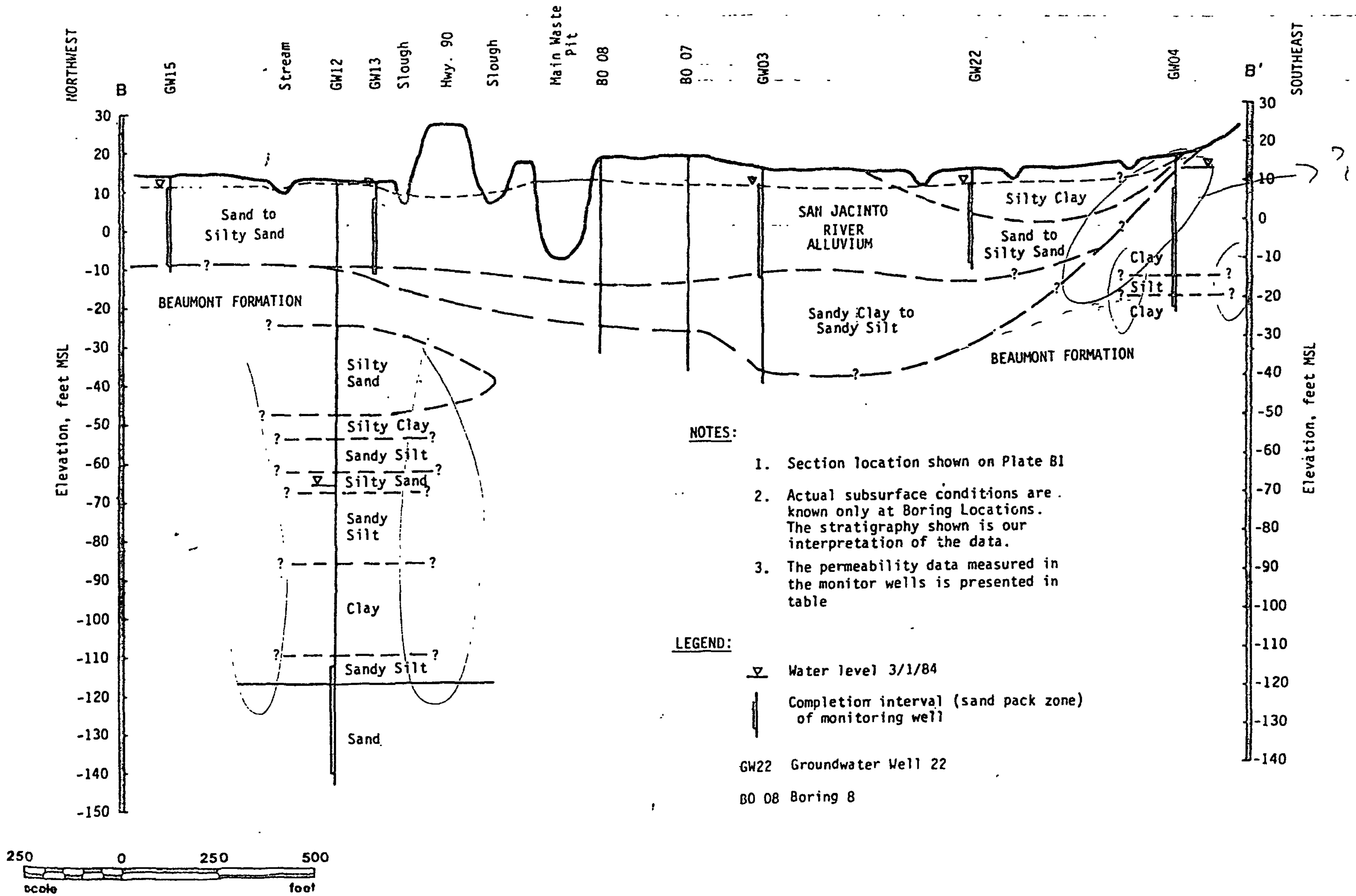

NORTHWEST
SOUTHEAST
B
B'
GW15
Stream
GW12
GW13
Slough
Hwy. 90
Slough
Main Waste Pit
BO 08
BO 07
GW03
GW22
GW04
Elevation, feet MSL
30
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
-120
-130
-140
-150
Sand to Silty Sand
BEAUMONT FORMATION
Silty Sand
Silty Clay
Sandy Silt
Silty Sand
Sandy Silt
Clay
Sandy Silt
Sand
SAN JACINTO RIVER ALLUVIUM
Silty Clay
Sand to Silty Sand
Sandy Clay to Sandy Silt
Clay
Silt
Clay
BEAUMONT FORMATION
NOTES:
1. Section location shown on Plate B1
2. Actual subsurface conditions are known only at Boring Locations. The stratigraphy shown is our interpretation of the data.
3. The permeability data measured in the monitor wells is presented in table
LEGEND:
Water level 3/1/84
Completion interval (sand pack zone) of monitoring well
GW22 Groundwater Well 22
BO 08 Boring 8
250
0
250
500
scale
feet

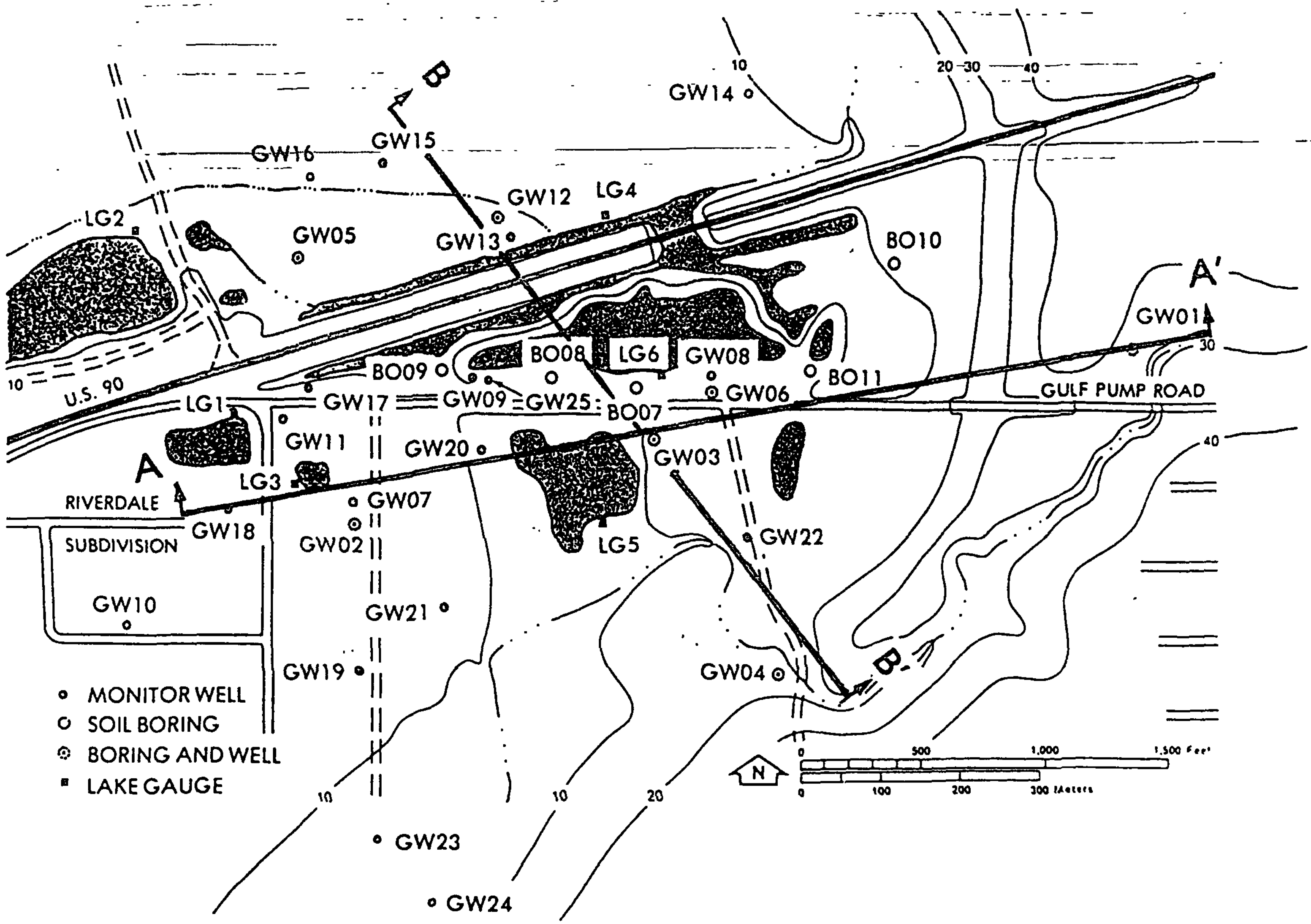

Figure 4-4
CROSS- SECTION LOCATIONS

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2. The alluvium is relatively permeable and should be considered continuous throughout the river valley; however, layers of lower permeable silts and clays also exist in the deposit;
3. The contact between the alluvium and the underlying Beaumont Formation is irregular because of the meandering of the San Jacinto River; and
4. The measured vertical permeability in the alluvial sands is on the order of 10^{-3} cm/sec. Typically, the horizontal permeability is much larger than the vertical permeability in alluvial deposits. The horizontal permeability in the alluvial sands is estimated to be on the order of 10^{-2} cm/sec.

Based on what

The alluvial deposits are underlain by Pleistocene sediments to great depths. The Beaumont Formation is the first Pleistocene deposit underlying the alluvium and it is predominantly clay with some discontinuous silt and sand layers. The clays are generally highly plastic with a stiff to very stiff consistency. The clays have a blocky secondary structure with occasional slickensides.

Sand and silt layers in the clay are typically less than a few feet thick. Borings B006, B012 and GW25 were drilled in the site area to the first significant sand layer in the Pleistocene clays. In boring B006, a very dense sand layer was encountered at a depth of 127 feet that extended to approximately 155 feet (bottom of boring). The sand is fine grained with some silt. Permeabilities are estimated to be on the order of 10^{-3} cm/sec.

were these measured if not why not.

Based on visual observation, odor and organic vapor readings with a photoionization detector (PID) contaminated soils samples from the borings were observed only in the upper 25 feet and only in borings around the perimeter of the main waste lagoon including boring B011 to the southeast. Positive PID readings were noted at B006, B008, B009, B011 and GW25. No soil contamination was physically observed in the remaining borings.

4.2 GROUNDWATER MONITORING WELLS

4.2.1 <u>Installation and Development</u>

Select borings were converted to groundwater monitoring wells by reaming with either a 4-inch or an 8-inch diameter bit to the desired depth. Immediately after reaming, a 2-inch or 4-inch diameter, threaded, flush-joint PVC casing was set in the boring. The bottom portion of the casing was screened and set so as to penetrate the bottom of the pervious sand stratum. The screened portion was machine slotted at 0.02-inch widths and was wrapped in geotextile filter fabric (Fibertex, grade 150).

After setting the casing to the desired depth, the boring was flushed of drilling fluids by pumping clean water down through the casing and out through the screen and a spring-loaded check valve at the bottom of the casing. Flushing continued until the return flow of water was free of significant quantities of drilling mud additives or natural mud. For shallow wells, 300 to 500 gallons of clean water was typically used while 600 to 800 gallons were used on the deeper wells.

After flushing, the annulus of the screened casing was backfilled with a medium to coarse sand. After the sand backfill was placed, the remaining portion of the annulus was filled with a cement/bentonite slurry. On shallow wells, the slurry was poured from the ground surface while on the deep wells it was pumped through a tremie pipe. Vented plastic caps were placed on the PVC casing, and locking 5-foot long metal protector casings were set around the wells. The protective casings were then concreted in place. Details of the well construction are presented on Table 4-6, on the Boring Logs, and on the Subsurface Profiles in Appendix B.

The wells were developed by removing approximately 3 to 11 times the volume of water in the casing. As a minimum, the wells were purged until the water clarity significantly improved. The amount of water in each well is presented in Table 4-6. As an additional aid in evaluating the well's development, the conductivity of the evacuated water was measured in the wells installed in April 1983. These conductivity readings remained relatively constant during the development.

Most of the wells were developed by evacuating the water from the well using either a 20 cfm or a 175 cfm air compressor. A 3/4-inch air hose lowered to the bottom of the well maintained approximately 85 to 100 psi during development. The water obtained from wells GW01 through GW07 was discharged into barrels by using an inverted U-shaped diverter placed over the top of the

Table 4-6. Well Construction Details

Well Number	Ground Surface Elevation (ft.)	Top of Aquifer Elevation (ft.)	Bottom of Aquifer Elevation (ft.)	Top of Screen Elevation (ft.)	Bottom of Screen Elevation (ft.)	Water Level on 12/07/83 Elevation (ft.)	Volume of Water in Casing (gallons)	Amount of Water Purged (gallons)	Est. Water Lost in Drilling (gallons)
GW01	37.8	37.8	-5.2	22.8	-7.2	21.9	19	150	15
GW02	17.6	-29.9	-37.9	-20.4	-40.4	4.2	29	115	10
GW03	13.2	12.2	-12.8	6.2	-13.8	8.7	15	200+	20-25
GW04	16.8	-15.2	-19.7	7.8	-22.2	11.3	22	130	15-20
GW05	12.6	11.1	-8.9	7.6	-12.4	9.5	15	45	5-10
GW06	13.9	-112.6	--	-113.1	-128.1	-66.6	40	550	20-25
GW07	17.5	1.5	-4.5	3.5	-6.5	12.0	12	100	0
GW12	11.5	117.5	--	-120.4	-140.5	-65.6	49	--	--
GW13	11.6	11.6	-9.4	7.6	-12.4	9.6	4	--	--
GW14R	7.9	0	--	4.4	-15.6	8.7	4	--	--
GW15	13.8	13.8	-10.2	10.8	-9.2	9.4	3	--	--
GW16	12.5	12.5	--	9.0	-11.0	9.2	4	--	--
GW17	16.2	16.2	--	13.2	-6.8	10.6	3	--	--
GW18	13.5	13.5	--	10.0	-10.0	11.5	4	--	--
GW19	14.6	11.6	--	11.1	-8.9	11.2	4	--	--
GW20	8.8	1.8	--	5.8	-14.2	9.4	4	--	--
GW21	12.1	-1.9	--	10.9	-9.1	9.8	3	--	--
GW22	13.2	1.2	--	9.7	-10.3	9.6	4	--	--
GW23	10.7	-1.3	--	-2.3	-7.3	7.8	2.5	--	--
GW24	7.7	-9.8	--	-10.3	-15.3	7.1	3.5	--	--
GW25	16.0	-127.0	--	-129.0	-134.0	--	--	--	--

Supposed to be a deep well

Note: All elevations are relative to Mean Sea Level (1963 Datum).

casing. The volume removed was recorded and then placed in the main lagoon to prevent contamination of the area around the well. Wells GW05, GW12, GW14R, GW23, GW24 and GW25 were developed by bailing.

4.2.2 Monitor Well Tests

Slug tests were performed on wells GW01 through GW07 in order to evaluate the hydraulic conductivity (coefficient of permeability) of the screened aquifer. The "slug" consisted of a sand-filled water-tight section of 2-inch diameter PVC casing approximately 5 feet long.

The slug was quickly lowered into the well, causing a rise in water level equal to the displaced volume of water. The water level immediately began dropping and was allowed to stabilize. With rapid removal of the slug, the water level was suddenly lowered and recharge began. During the test, water level versus time measurements were taken using a pressure transducer placed approximately 10 feet below the water surface. The pressure transducer was sensitive to 1 millivolt, which corresponds to a 0.06 foot change in water level. Readings were taken manually as well as with a strip-chart recorder that provided a continuous graph of the transducer readout with time. To better substantiate the results, the water level change with time for both the sudden addition and removal of the slug was recorded.

A graphical plot of the slug test data is presented in Appendix D.

Slug test data for fully or partially-penetrating wells in unconfined aquifers (wells GW01, GW03, GW05 and GW07) were reduced using the procedure developed by Bouwer and Rice (1976). Data for wells GW02, GW04 and GW06 were reduced using procedures for confined aquifers developed by Cooper, Bredehoeft and Papdopulos (1967). The calculated permeability of the screened aquifers is presented in Table 4-7 and in Appendix D.

4.2.3 Staff Gauges

During the December 1983 field investigation, staff gauges were constructed and set in the various bodies of water in the site area. The gauge locations are shown on Figure 4-5, Groundwater Contours 12-7-83. The water level readings for the monitoring period are presented on Table 4-8. Water levels on May 17, 1984 are shown on Figure 4-6.

Table 4-7. Permeabilities from Slug Test

Well Number	Unified Soil Classification System	Coefficient of Permeability, K (cm/sec)
GW01	SM	3.7×10^{-3}
GW02	ML	8.7×10^{-4}
GW03	SP	3.8×10^{-3}
GW04	ML	7.9×10^{-4}
GW05	SP-SM	1.3×10^{-3}
GW06	SM	3.6×10^{-4}
GW07	SM	2.3×10^{-3}

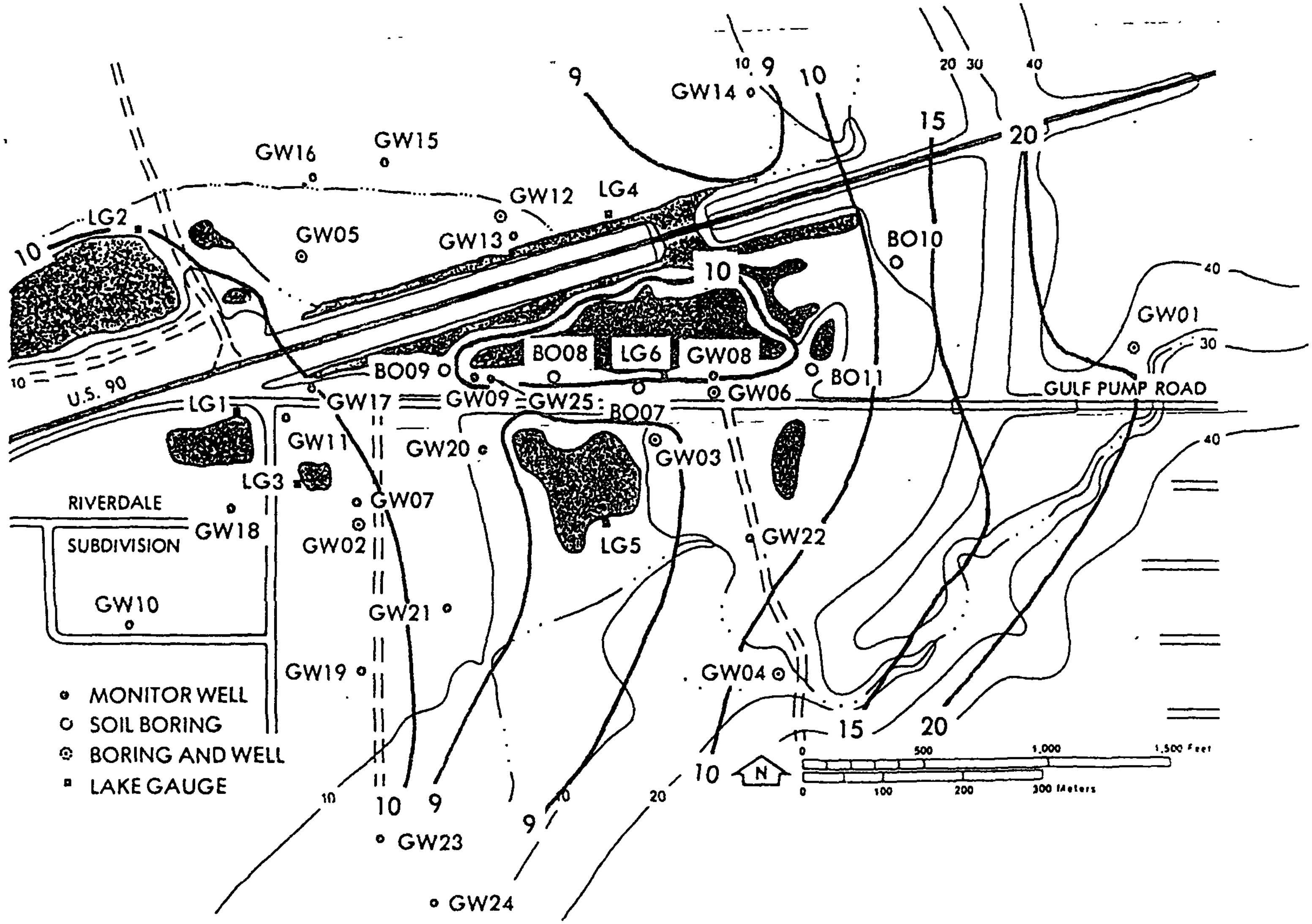

Figure 4-5
GROUND WATER CONTOURS
12-7-83

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Table 4-8. Lake Gauge Elevations

Gauge	11/30/83	12/05/83	12/07/83	12/19/83	2/17/84	2/19/84	3/01/84	5/17/84
LG-1	13.35	13.54	13.56	--	--	--	13.32	12.90
LG-2	10.13	10.23	10.24	--	10.40	10.29	10.26	9.80
LG-3	12.84	12.93	12.90	12.98	13.32	13.31	13.31	12.67
LG-4	9.17	9.29	9.27	--	--	--	--	--
LG-5	8.53	9.17	8.69	8.69	8.21	--	--	--
LG-6	11.43	11.53	11.51	--	11.50	11.50	11.50	<10.77

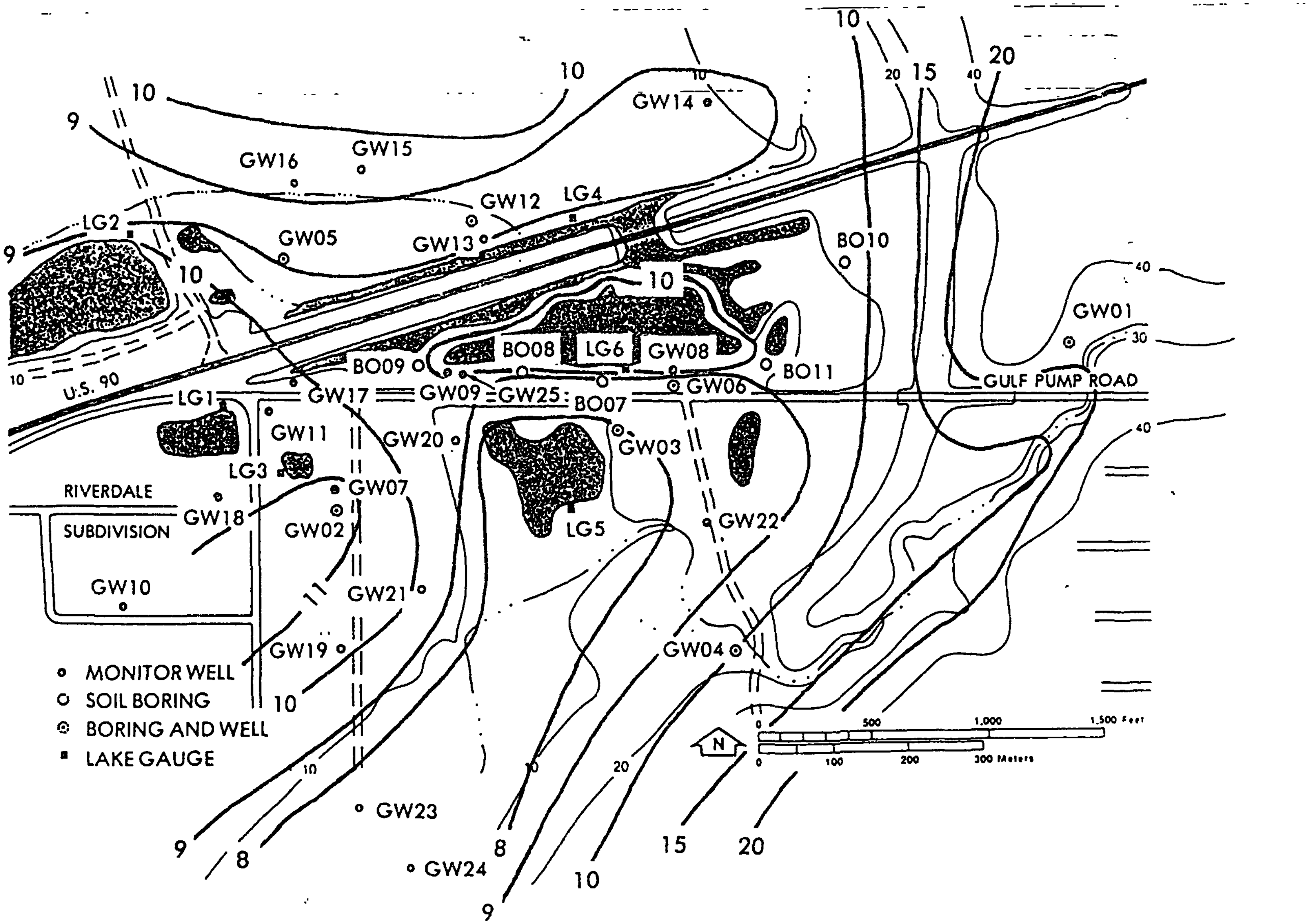

Figure 4-6
GROUND WATER CONTOUR
5-17-84

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ESE

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4.2.4 Groundwater Measurements

Groundwater measurements were taken in the monitoring wells over a one-year period (between April 1983 and May 1984). A complete listing of all the dates and water levels is presented in Table 4-9. Hydrographs of the monitor wells are presented on Figures 4-7 through 4-11 and in Appendix E.

What sand are the 01, 02, 04 wells screened into?

There are sixteen wells screened in the alluvial sediments and five wells (GW01, GW02, GW04, GW06 and GW12) screened in the Pleistocene deposits, two of which (GW06 and GW12) are deep wells screened in the first significant sand layer below the alluvium (well GW25 was drilled in May 1984 to replace GW06). Over the 13-month monitoring period, the maximum and minimum recorded groundwater fluctuation in the wells screened in the alluvium was 3.51 feet and 0.49 feet, respectively. The wells in the upper Pleistocene deposits had fluctuations between 0.91 feet in well GW01 to 3.73 feet in well GW04. The two deep wells, GW06 and GW12, had fluctuations of 2.45 feet and 0.97 feet, respectively. The water level fluctuations were compared between wells as an aid in determining if there are confined layers in the alluvium and if the silt and sand layers in the Pleistocene Formations are hydraulically isolated from the alluvium.

Two of the wells (GW14 and GW20) are located in marshes and when there was standing water in the marshes, the water level in the wells corresponded approximately to the surface water level.

4.2.5 Assessment

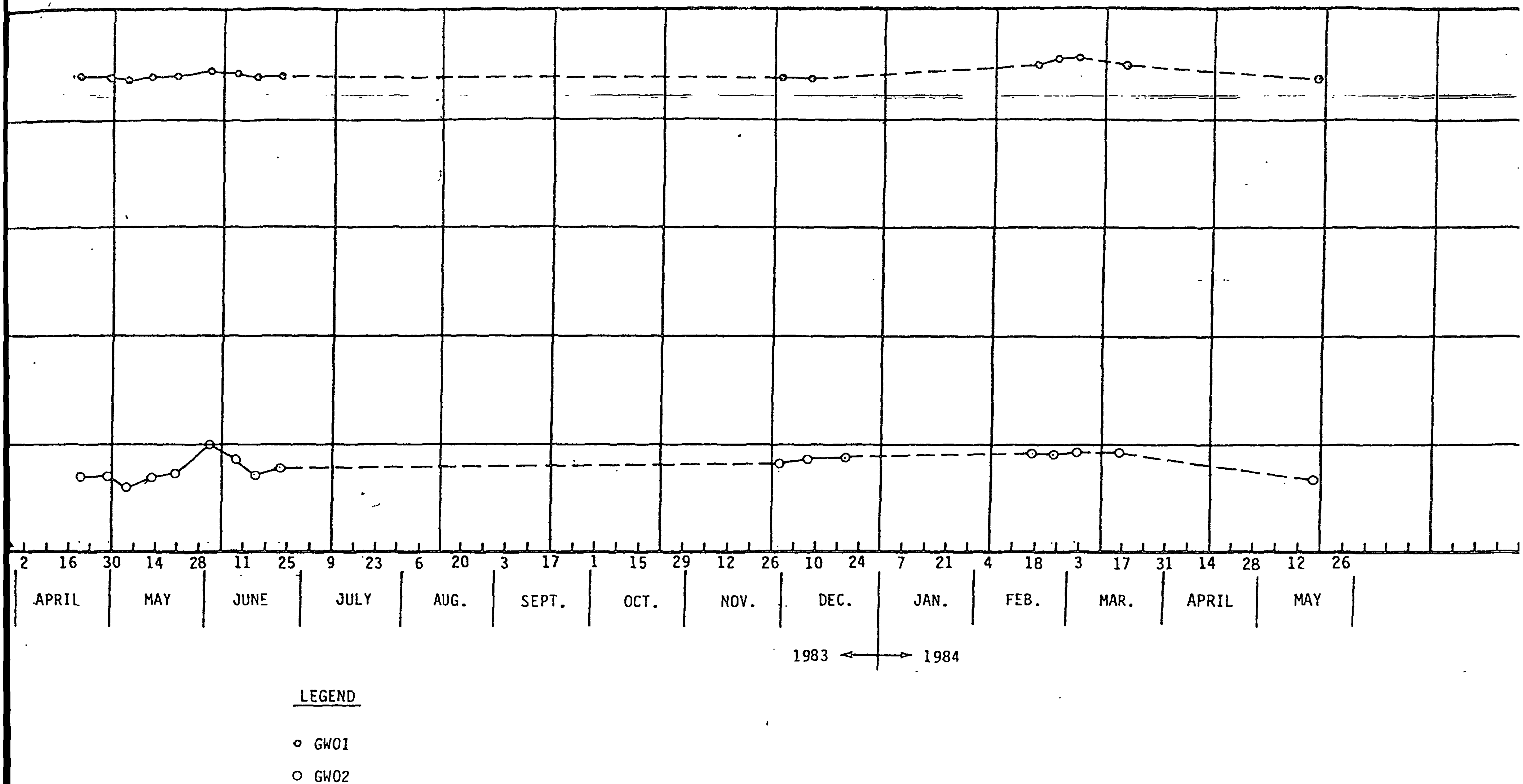
The groundwater system in the French Limited site area is assessed as follows. The site is underlain by permeable river alluvium that extends to maximum depths of approximately 55 feet. This alluvium comprises the Upper Aquifer which is generally an unconfined system throughout the site area. Groundwater levels in the Upper Aquifer are generally near the ground surface. Groundwater flow in the Upper Aquifer is confined to the alluvium by the relatively impermeable Pleistocene clay deposits which underlie the alluvium and form the east valley wall. The Pleistocene deposits within 155 feet of the ground surface (maximum depth explored for this investigation) form an Aquitard which restricts downward groundwater migration from the alluvium. The Pleistocene deposits generally consist of low permeability clays; however, some thin silt ?

Table 4-9. Piezometric Levels in Monitoring Wells

Monitor Well Number	1983 4/20	4/29	5/04	5/12	5/20	6/01	6/08	6/15	6/22	11/30	12/05	12/07	12/19	1984 2/17	2/24	3/01	3/16	5/17
	Piezometric Level Elevations (Feet Mean Sea Level)																	
GW01	22.08	21.85	21.76	21.87	21.97	22.22	22.08	21.90	21.92	21.89	21.93	21.91	—	22.48	22.69	22.77	22.53	21.79
GW02	3.59	3.47	3.07	3.48	3.83	4.98	4.44	3.62	3.85	3.98	4.23	4.15	4.34	4.68	4.65	4.64	4.67	3.23
GW03	8.84	8.47	8.33	9.08	9.43	10.23	9.24	8.82	9.19	8.47	8.71	8.71	9.05	9.84	9.52	9.52	9.17	8.08
GW04	11.93	11.39	11.23	12.05	13.10	12.39	12.03	11.42	12.32	10.77	11.22	11.33	—	13.79	13.52	13.38	12.72	10.06
GW05	9.79	9.46	9.16	10.06	11.49	10.86	10.62	9.86	10.45	8.92	9.42	9.52	—	11.08	10.94	10.98	—	8.64
GW06	—	-68.79	-68.54	-68.49	-68.33	-68.37	-68.20	-68.23	-68.08	-66.67	-66.54	-66.56	—	-66.50	-66.48	-66.45	-66.34	*
GW07	12.30	11.93	11.93	11.98	12.15	14.33	13.98	13.56	13.54	11.85	12.69	11.99	12.14	12.47	12.41	12.40	12.22	11.13
GW08	—	9.78	—	—	10.21	12.21	11.03	9.20	10.98	9.67	10.15	10.19	—	11.04	10.82	10.82	10.64	9.09
GW09	—	9.47	—	—	9.91	11.08	10.52	8.88	10.24	9.77	10.21	9.88	10.05	10.15	10.08	10.15	10.03	9.33
GW12	—	—	—	—	—	—	—	—	—	-66.25	—	-65.63	—	-65.90	-65.80	-65.28	—	-65.58
GW13	—	—	—	—	—	—	—	—	—	8.89	9.62	9.62	—	9.83	10.30	10.40	—	8.95
GW14R	—	—	—	—	—	—	—	—	—	8.10	8.64	8.74	—	8.51	8.61	8.73	—	7.3
GW15	—	—	—	—	—	—	—	—	—	9.08	9.48	9.40	—	10.73	10.31	10.69	—	9.51
GW16	—	—	—	—	—	—	—	—	—	8.95	9.33	9.22	—	10.77	10.80	10.85	—	9.46
GW17	—	—	—	—	—	—	—	—	—	10.33	10.64	10.57	10.58	10.82	10.74	10.71	10.67	10.07
GW18	—	—	—	—	—	—	—	—	—	11.03	11.66	11.45	11.62	12.21	11.84	12.01	—	10.32
GW19	—	—	—	—	—	—	—	—	—	10.97	11.32	11.20	11.85	12.07	12.03	11.95	11.81	10.26
GW20	—	—	—	—	—	—	—	—	—	9.13	9.28	9.20	9.22	—	9.50	9.57	9.45	9.08
GW21	—	—	—	—	—	—	—	—	—	9.42	9.88	9.80	9.45	10.04	9.05	10.10	10.04	*
GW22	—	—	—	—	—	—	—	—	—	8.84	9.43	9.60	—	12.21	11.82	11.75	11.0	8.7
GW23	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	7.8
GW24	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	7.1

* Plugged.

Notes:
1. Elevation refers to Mean Sea Level (1963 Survey).
2. GW06 was replaced with GW25 on May 15, 1984.



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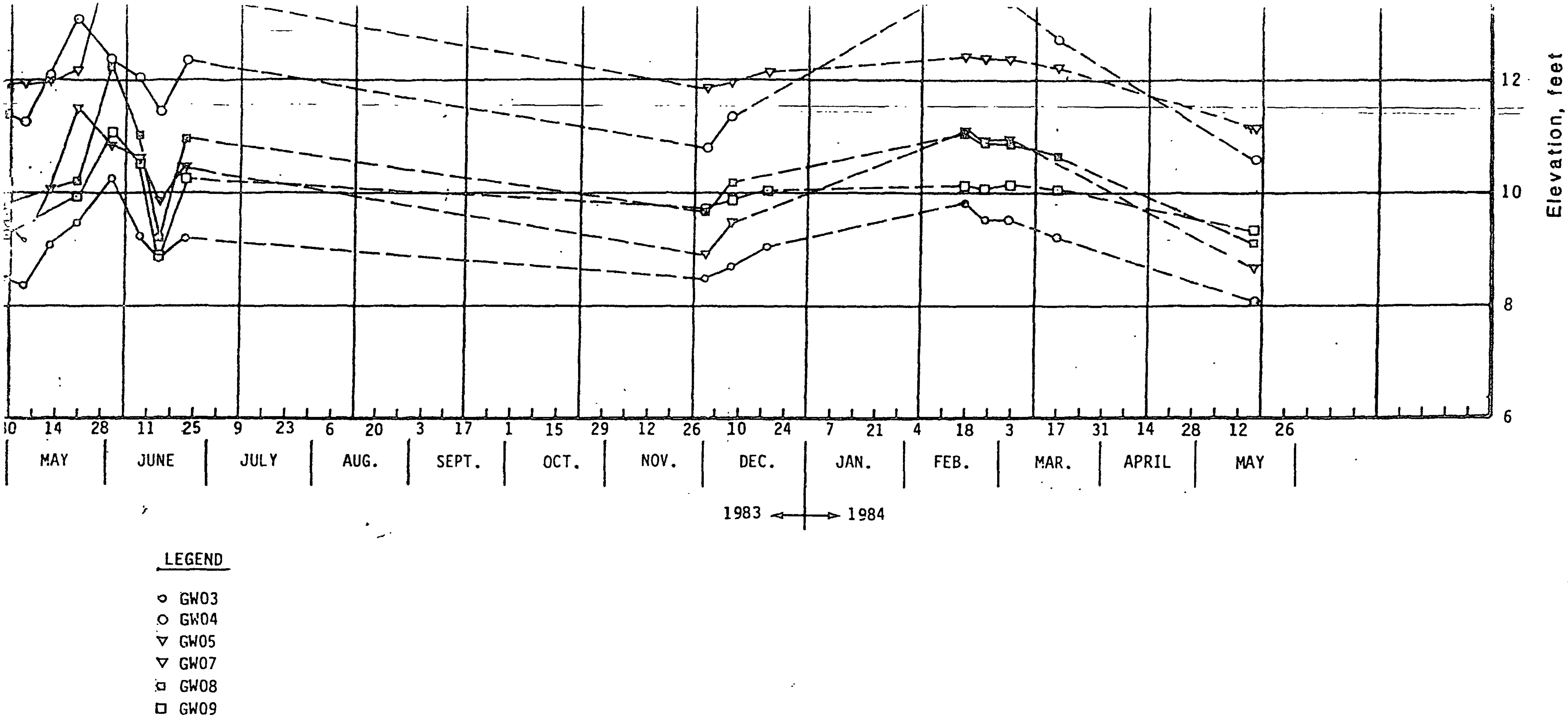


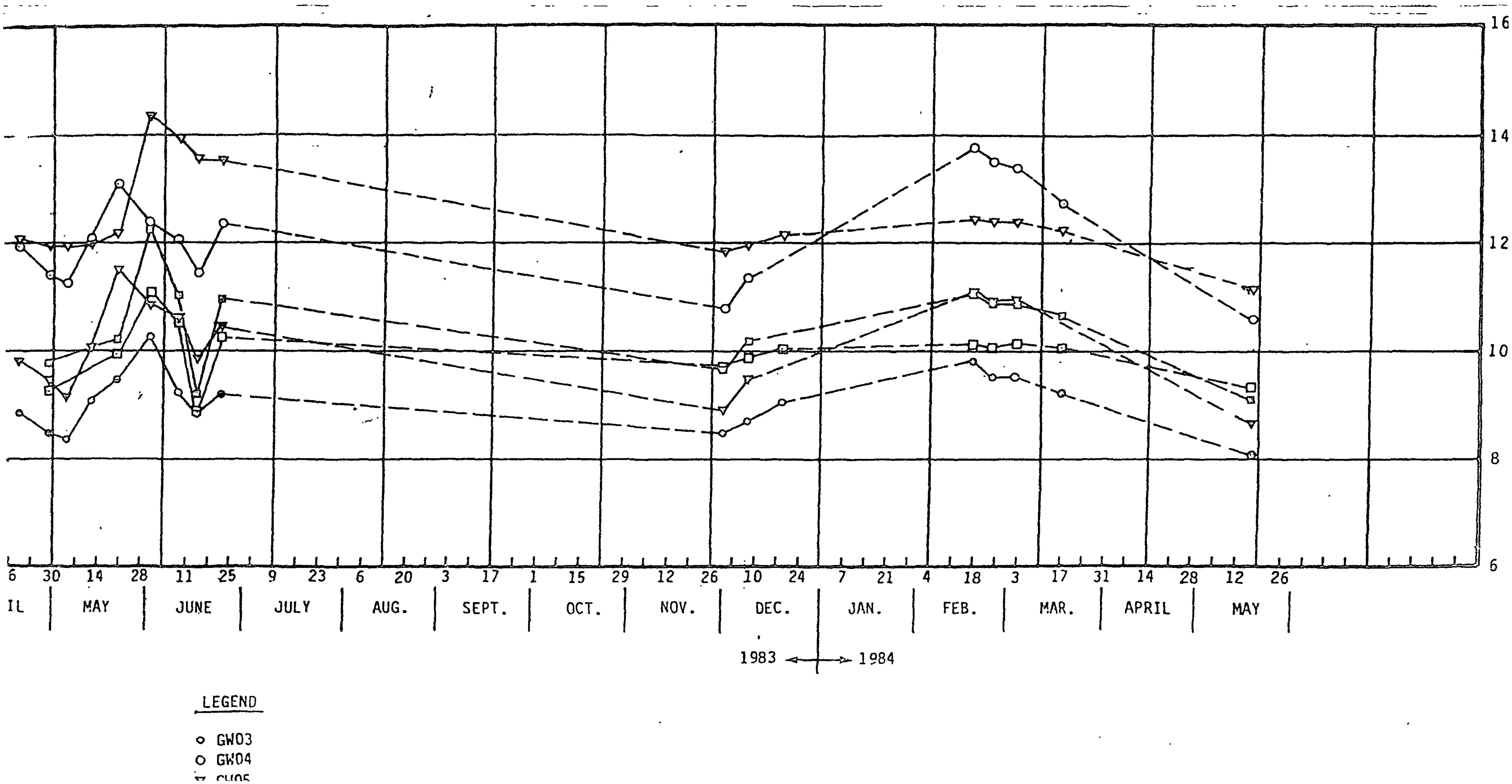
YDROGRAPH

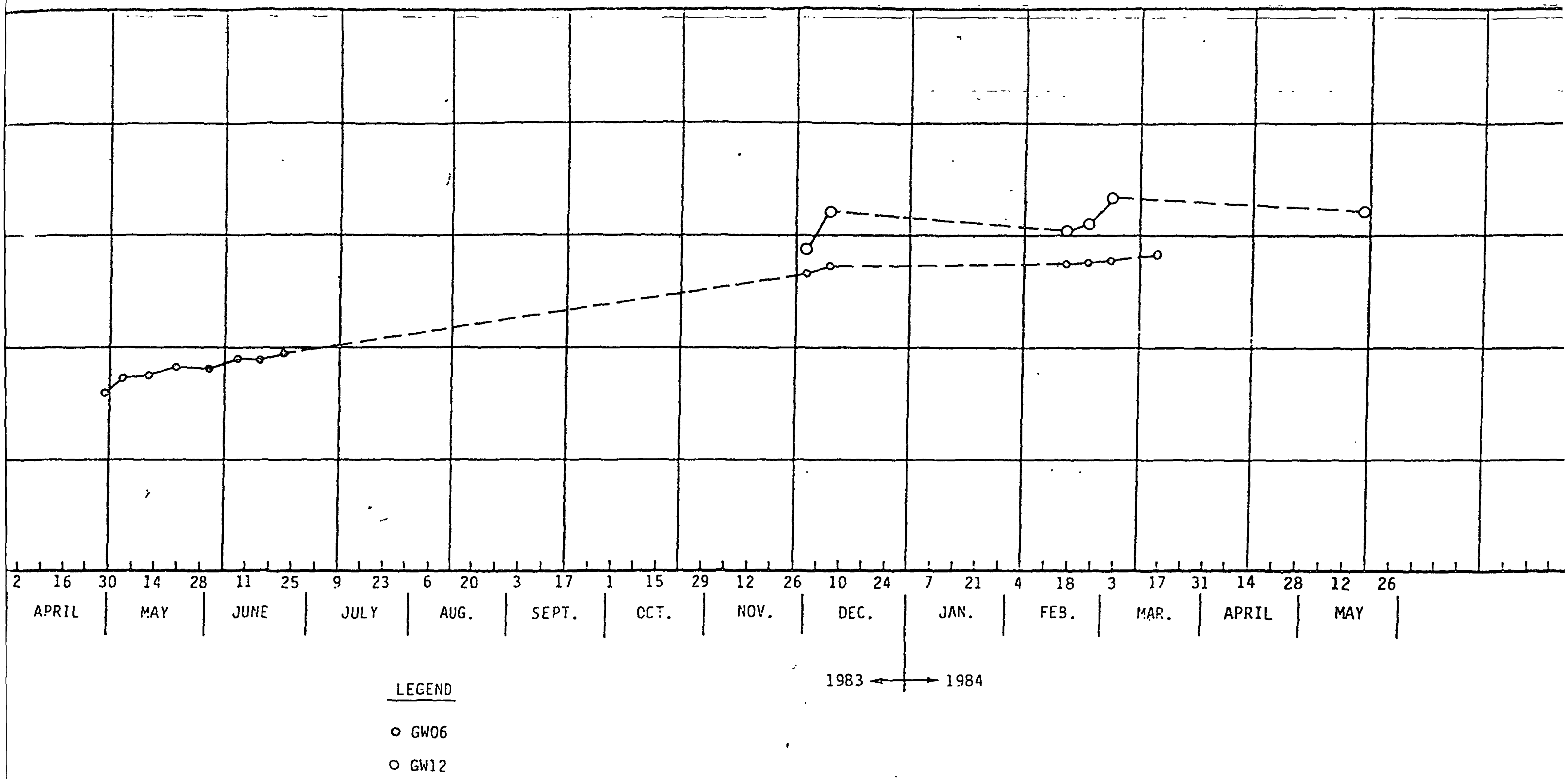
FRENCH LIMITED SITE

Prepared for:
TEXAS DEPARTMENT OF WATER RESOURCES

DAT JUNE, 1984 PROJECT NO. 1633-20-001

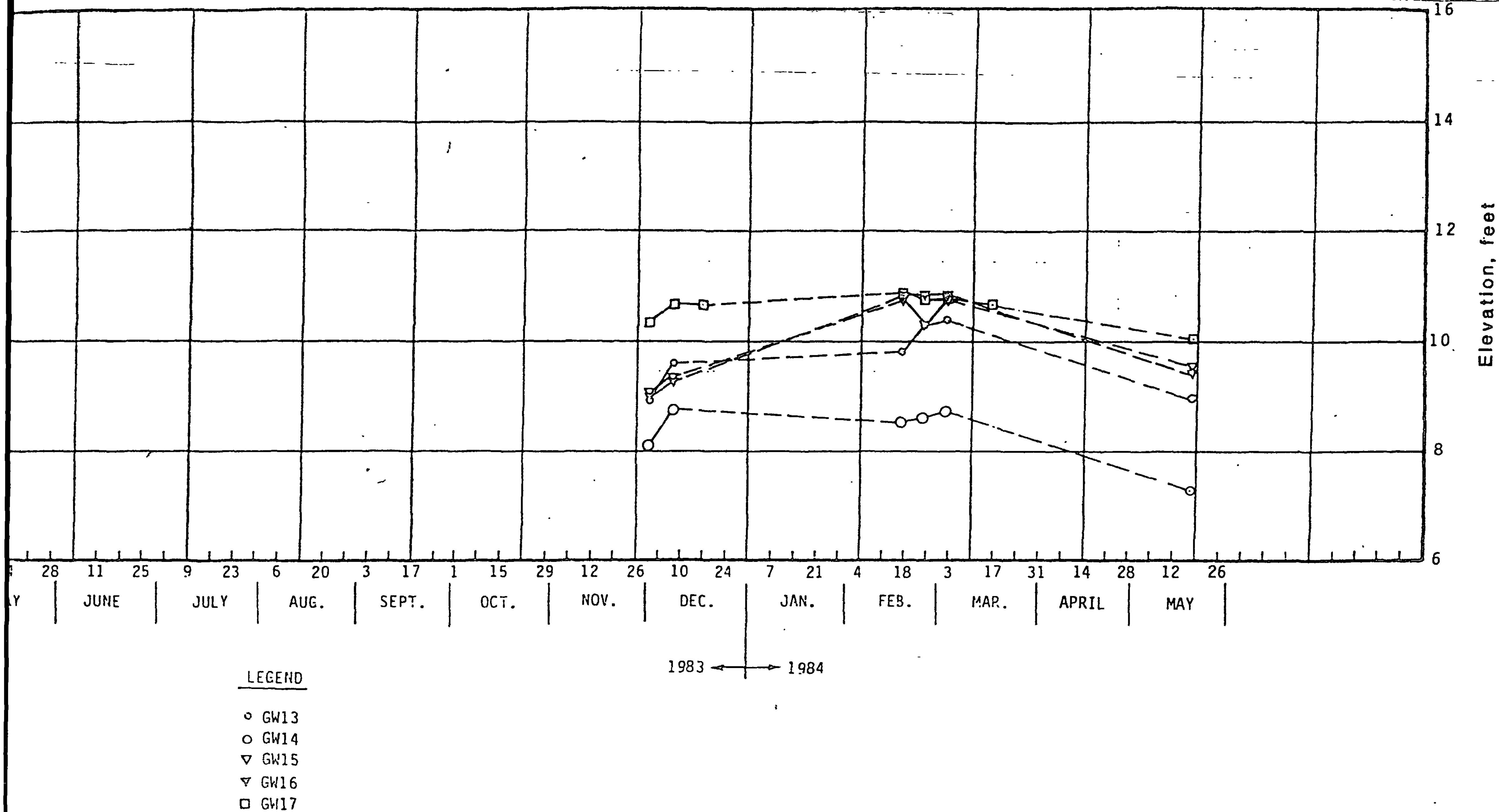
GROUNDWATER ELEVATIONS versus TIME





WATER HYDROGRAPH

Prepared for:
TEXAS DEPARTMENT
RESOURCES



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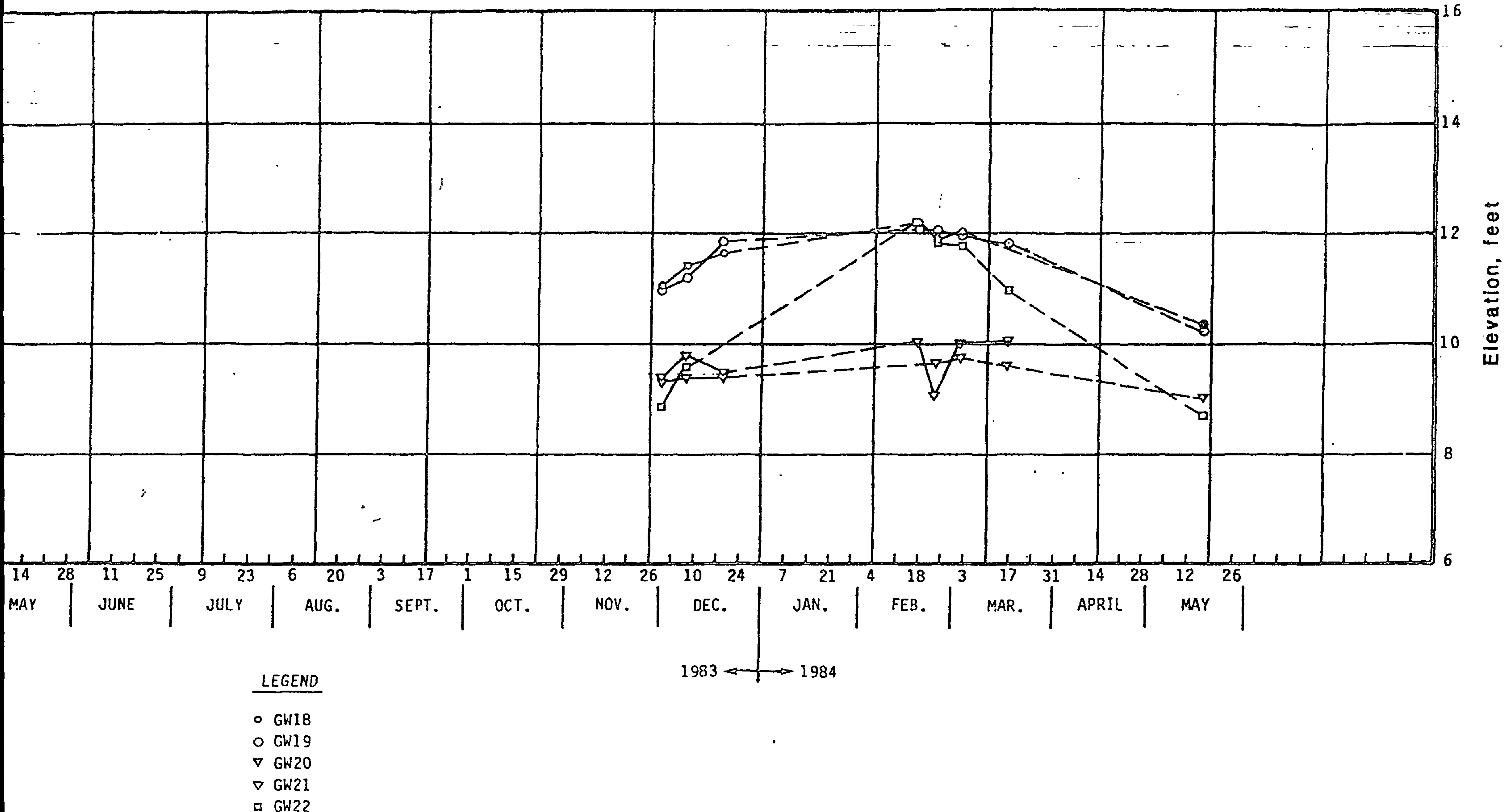

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and sand layers are present in the clays. The first significant sand layer in the site area (about 30 feet thick as shown in GW06) is at a depth of approximately 125 feet. Subsurface profiles through the site area showing the extent of the alluvium (Upper Aquifer) and the Pleistocene (Beaumont Formation) deposits are shown on Figures 4-3 and 4-4, and in Appendix B.

4-2 & 4-1

The piezometric water level in this deep sand layer (referred to as the Lower Aquifer) is approximately 80 feet below the ground surface. The 75-foot difference in water levels between the Upper and Lower Aquifer indicated the two are hydraulically isolated. Another indication of hydraulic isolation between the two aquifers is the water level fluctuations. The Upper unconfined aquifer has larger relatively rapid water level fluctuations because it is recharged locally from the surface. Fluctuations in the Lower Aquifer are smaller and of longer duration. The majority of the monitoring wells are screened in the Upper Aquifer because the waste pit is located in the alluvium and the Upper Aquifer is essentially hydraulically isolated from lower confined aquifers by the Pleistocene deposits. The monitoring wells and lake gauges were used to prepare the two groundwater contour maps presented on Figures 4-5 and 4-6 and in Appendix E. The groundwater contour maps are used to determine the gradients and direction of groundwater flow. The direction of flow is perpendicular to the groundwater contours and the hydraulic gradient is the change in head between two points on a flow line divided by the horizontal distance between the two points.

The groundwater contour maps show the groundwater flow from the main pit to be radially outward in all directions (i.e. the pit is recharging the groundwater). Beyond the berm surrounding the pit, the groundwater flow toward the east is restricted by the Pleistocene clays and the higher piezometric water levels in the silt and sand layers (see wells GW01 and GW04). North of the pit on the northside of U.S. Highway 90, the hydraulic gradients are very flat (less than 0.001). Four of the wells on the north side of U.S. Highway 90 had water levels above the elevation of the slough indicating groundwater flow from the north toward the slough. The fifth well GW14R had water levels slightly lower than the slough which indicates flow from the pit area toward the northeast. The higher groundwater levels in the Riverdale Subdivision prevent groundwater flow in a westerly direction from the pit. South of the pit, the groundwater levels gradually drop toward the southwest in a fairly narrow zone between the valley wall on the southeast and Riverdale Subdivision on the northwest. The groundwater flow beyond the investigation area is unknown but is likely toward the San Jacinto River. Thus, groundwater migration from the French Limited site is predominantly toward the south.

The groundwater velocity, using Darcian flow, is determined by multiplying the coefficient of permeability by the hydraulic head. The groundwater velocities at several locations on the site were computed by using a permeability of 3×10^{-2} cm/sec for the alluvial sands. The gradient used and velocities calculated are presented on Table 4-10.

These velocities and gradients are for existing conditions at the site. Pumping from area sand pits in previous years probably resulted in different gradients, flow directions and higher velocities than now observed. Therefore, the extent of the contaminant plume cannot be located using the present gradients and velocities. The better indicator would be groundwater analysis from monitoring wells. In addition, the permeability of 3×10^{-2} cm/sec used for the alluvial sands is considered a representative horizontal permeability for sands with only trace fines. The clay, silt and silty sand layers in the alluvium have lower permeabilities.

The groundwater flow path from the French Limited site appears to pass beneath the southern portion of the Old Harris County landfill located east of Riverdale Subdivision.

The Pleistocene deposits underlying the Upper Aquifer are predominantly clay with occasional thin discontinuous silt and sand layers. The first significant sand layer in the Aquitard is at a depth of approximately 125 feet. The gradient between the Upper and Lower Aquifers is approximately 1.0 and by conservatively using a permeability of 10^{-7} cm/sec, the vertical groundwater velocity from the Upper to the Lower Aquifer is approximately 0.1 feet/year.

how was this number determined

Table 4-10. Groundwater Gradients and Velocities on December 7, 1983

Direction of Flow	Distance Between Points (feet)	Water Level Difference (feet)	Gradient (feet/feet)	Groundwater Velocity (feet/day)
Main Pit to GW08	60	1.32	0.022	1.9
GW09 to GW20	300	0.68	0.0023	0.2
GW03* to GW24*	2,200	0.98	0.0004	0.04
Main Pit to Slough	40	2.24	0.056	4.8
Slough to GW14	400	0.53	0.0013	0.1

* Readings on May 17, 1984.

Note: 3×10^{-2} cm/sec used for coefficient of permeability.

4.3 GROUNDWATER SAMPLING

4.3.1 Groundwater Sampling Methodology

4-11

Twenty-eight new monitor wells, two existing monitor wells, and two residential wells in the Riverdale Subdivision were sampled (see Table 4-1 and Figure 4-12 for exact locations). The monitor wells were sampled after evacuating a volume of water equal to three to five times the volume in the well casing. This water was pumped into drums, using a large peristaltic pump or a construction pump with a PVC dip tube. The samples collected in April 1983 were taken with a variable speed peristaltic pump set at a slow pumping rate (400 to 600 ml/min). A new length of Teflon tubing was used at each well. Sample fractions needed for volatile organic analysis were obtained using a new PVC bailer. All samples collected in November 1983 were taken with PVC bailers.

GW06 and GW12 were evacuated and sampled using a PVC bailer because the water level was some 80-feet below the ground surface, and the peristaltic pump was not able to pump at this head.

The residential wells were sampled at their pump houses. In both cases, the faucets were located downstream of the holding tanks.

4.3.2 Chemical Results

The potential exists for the migration of contaminants in surface and ground waters. Since the waters can become a supply for human consumption, serious long-term health effects can result. Therefore, a comparison between contaminant levels and human health criteria is appropriate.

In April 1983, the background well GW01 (see Figure 4-12) exhibited chlorobenzene at 7 micrograms per liter (ug/l) or parts per billion (ppb) and at 6 ppb in the duplicate sample. A trace of phenol (5 ppb) and a relatively high conductivity of 1,301 micromhos per centimeter (umhos/cm) were observed in GW01 (Table 4-11). Mercury was observed in GW01 at trace levels (0.7 ppb) but was not found in any of the other wells.

GW01 is background well but is not completed in alluvial deposits according to statement on pg. 56 2nd ¶

The groundwater sample taken in April 1983 from shallow well GW08 located near the site exhibited significant levels of GC/MS volatiles, phenols (100 ppb), and a conductivity of 2,380 umhos/cm. Benzene was found in GW08 at 180 ppb,

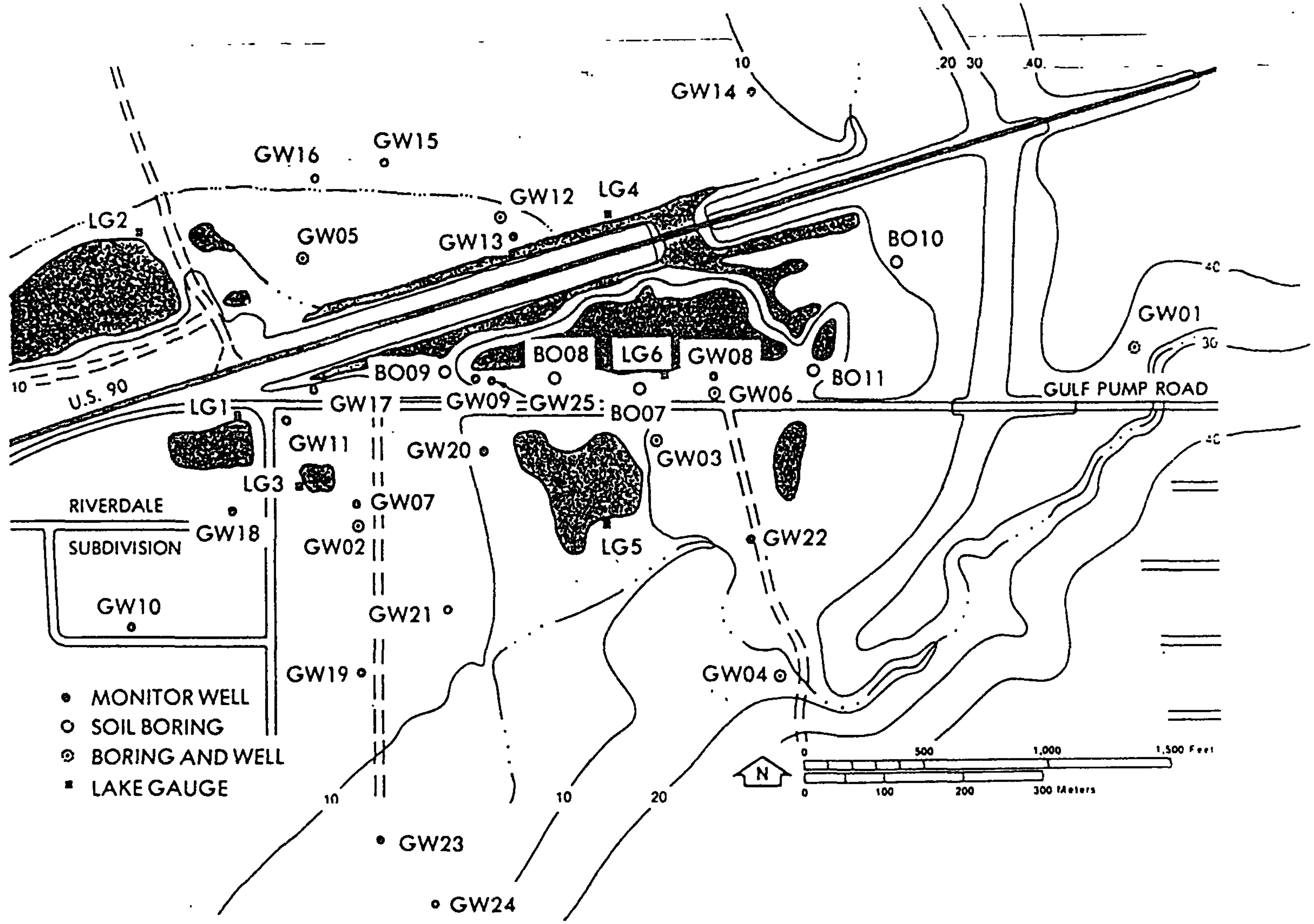

Figure 4-12
SOIL BORING/MONITOR WELL LOCATIONS

FRENCH LIMITED SITE

Prepared for:
TEXAS DEPARTMENT OF WATER RESOURCES

IAN / ESE / HLA

DATE: JUNE, 1984 PROJECT NO. 1633-20-001

Table 4-11. Chemical Analysis on Wells Sampled in Either April or November 1983

Parameters	Units	Human Health Criteria	GW01	GW01D	GW02	GW04	GW07	GW08	GW09	GW12	GW13	GW14	GW15	GW15D	GW16	GW17	GW18	GW19	GW20	GW21	GW22
			April 1983							November 1983											
Conventional Analysis																					
Carbon, TOC	ug/l		<DL	<DL	<DL	<DL	6300	149000	69000	5900	9800	5800	10200	10300	5000	4300	9900	23200	35800	82900	3900
Total Organic Halogen, TOX	ug/l		<DL	<DL	<DL	<DL	184	2950	<DL	58	97	52	61	38	91	32	66	49	73	250	120
Phenols, Total	ug/l		5.0	<DL	NA	NA	4.0	100	17.0	<DL	<DL	1	<DL	<DL	<DL	<DL	<DL	2	8	26	<DL
pH*	S.U.		7.1	7.1	7.8	6.7	6.4	6.5	6.2	8.8	6.8	NA	6.4	6.4	5.8	6.4	6.7	6.7	6.8	6.4	7.1
Conductivity*	umhos/cm		1301	1301	508	1109	783	2380	839	496	450	NA	205	205	108	302	361	1730	1210	1580	879
Metals					NA	NA				NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	ug/l	50	26.0	17.0			12.0	<DL	23.0												
Copper	ug/l		7.6	6.0			<DL	<DL	4.9												
Mercury	ug/l	0.144	0.7	0.3			<DL	<DL	<DL												
Lead	ug/l	50	<DL	5.7			<DL	<DL	5.9												
Zinc	ug/l		16.1	11.1			41.6	40.3	21.2												
GC/MS Volatiles					NA	NA				<DL	<DL	<DL			<DL		<DL	<DL			<DL
Benzene	ug/l	6.6	<DL	<DL			<DL	180	100				<DL	<DL		<DL			6	11	
Carbon tetrachloride	ug/l	4.0	<DL	<DL			<DL	44.0	<DL				<DL	<DL		<DL			<DL	<DL	
Chlorobenzene	ug/l	488	7.0	6.0			6.0	4.0	<DL				<DL	<DL		<DL			4	2	
Chloroethane	ug/l		<DL	<DL			<DL	45.0	4.0				<DL	<DL		<DL			<DL	<DL	
1,1-Dichloroethane	ug/l		<DL	<DL			<DL	130	<DL				2	2		<DL			<DL	<DL	
1,2-Dichloroethane	ug/l	9.4	<DL	<DL			<DL	440	<DL				<DL	<DL		2			<DL	2	
T-1,2-Dichloroethene	ug/l		<DL	<DL			<DL	180	<DL				<DL	<DL		<DL			<DL	<DL	
Ethylbenzene	ug/l	1,400	<DL	<DL			<DL	25.0	68.0				<DL	<DL		<DL			<DL	<DL	
Methylene chloride	ug/l	1.9	<DL	<DL			<DL	74.0	<DL				<DL	<DL		<DL			<DL	<DL	
Tetrachloroethene	ug/l	8.0	<DL	<DL			<DL	910	<DL				<DL	<DL		<DL			<DK	<DL	
Trichloroethene	ug/l	27	<DL	<DL			<DL	44.0	<DL				<DL	<DL		<DL			<DL	<DL	
Toluene	ug/l	14,300	<DL	<DL			<DL	67.0	31.0				<DL	<DL		<DL			<DL	<DL	
Vinyl chloride	ug/l	20	<DL	<DL			<DL	39.0	<DL				6	5		<DL			<DL	<DL	
GC/MS Acid Fraction					NA	NA	<DL		<DL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenol	ug/l	3,500						32.0													
GC/MS Base/Neutral					NA	NA	NA			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-ethylhexyl)phthalate	ug/l	15,000							13.0												
Naphthalene	ug/l							150	6.0												
PCBs/Pesticides			<DL	<DL	NA	NA	<DL	<DL	<DL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

NA = not analyzed
<DL = less than detection limit
* measured in the field

which is approximately 30 times above the proposed 10^{-5} incremental cancer risk human health criterion of 6.6 ppb (see Appendix F). Benzene was also seen in GW09 at 100 ppb. Carbon tetrachloride in GW08 at levels of 44 ppb exceeded the human health criterion of 4.0 ppb. Well GW08 also contained significant levels of 1,2-dichloroethane (440 ppb), which exceeds the criterion of 9.4 ppb. Vinyl chloride at 39 ppb was also present in GW08, which is double the health criteria of 20 ppb. Other volatiles (chloroform, methylene chloride, tetrachloroethene, and trichloroethene) were present in GW08 at levels exceeding human health criteria.

TDWR and USEPA sampled wells GW08 and GW09 on October 7-9, 1981, and found substantial levels of volatile organic compounds (see Table 4-12). The levels of contamination in April 1983 were similar for many of the compounds detected. Seasonal hydrologic factors could account for the concentration differences observed.

Deep well GW06 was sampled in April and again in November 1983 (see Table 4-13) and showed much lower TOC and conductivity levels than GW08 and GW09. The pH was 9.2 in April and 9.3 in November, whereas the shallow aquifer had pH in the range of 5.4 to 7.1. Deep well GW12 (see Table 4-11) had a pH of 8.8, almost as high as GW06. This high pH is common for the deeper aquifers in the area. GW02 into the Aquitard had a pH of 7.8, and the two samples in the Riverdale Subdivision (GW10--52 feet, GW11--87 feet) had pH of 7.7 and 7.6, respectively. Preliminary results from deep well GW06 indicated traces of four GC/MS volatiles. Upon further investigation the casing was found to have a split in it potentially allowing contaminated shallow ground water to enter the casing. The well was pumped extensively to remove any contaminants that could have entered the lower aquifer, the casing drilled out to the clay layer and then the hole was sealed from the bottom up with a cement-bentonite slurry. A new deep well GW25 was drilled in the immediate area, and chemical results will be available shortly.

The deep well GW12 installed in November 1983 north of U.S. Highway 90 was analyzed by GC/MS for volatiles, but nothing was found above detection limit. The shallow well GW13 adjacent to GW12 had a pH of 6.8, and exhibited no contamination in the GC/MS volatile fraction either.

Table 4-12. Summary of French Limited Groundwater Chemistry by TDWR and USEPA, October 7 to 9, 1981

Parameters	Units	Well Number GW08	GW09
Sample No: (Organic)		495	496
Acid Compounds			
Phenol	ug/l	102	122
2,4-Dimethylphenol	ug/l		57
Base Neutral Compounds			
Naphthalene	ug/l	112	26
Volatile Compounds			
Carbon Tetrachloride	ug/l	29	
Benzene	ug/l	148	134
1,2-Dichloroethane	ug/l	1,631	
1,1-Dichloroethane	ug/l	255	
1,2-Trans-Dichloroethylene	ug/l	1,924	
Ethylbenzene	ug/l	16	52
Toluene	ug/l	47	17
Trichloroethylene	ug/l	217	
Vinyl Chloride	ug/l	209	
Chloroform	ug/l	584	
Methylene Chloride	ug/l	728	

Three other shallow wells (GW14, GW15 and GW16) were installed in November north of U.S. Highway 90. Well GW14 exhibited 1 ppb phenol, 52 ppb TOX, and was free of GC/MS volatile contamination. GW15 showed 61 ppb TOX (38 ppb in the duplicate), and traces of two compounds in the GC/MS volatile scan: 1,1-dichloroethane at 2 ppb (2 ppb in the duplicate); and vinyl chloride at 6 ppb (5 ppb in the duplicate). GW16 further west of GW15 was free of GC/MS volatile contamination. Well GW05 north of U.S. Highway 90 was free of GC/MS detectable contamination in both the April and November samples (see Table 4-13).

Wells GW02, GW03, GW04, and GW07 are located south of Gulf Pump Road. In April 1983, shallow well GW07 exhibited 6 ppb of chlorobenzene. The shallow well GW07 exhibited 6.3 ppm TOC and 184 ppb TOX, while the adjacent deep well showed no detectable levels of either of these indicators. GW03, immediately south of Gulf Pump Road, exhibited 20 ppm TOC and 94 ppm TOX in April. The November sample from GW03 was analyzed by GC/MS for volatile compounds (see Table 4-13) and showed benzene at 22 ppb; 1,1-dichloroethane at 23 ppb; 1,2-dichloroethane at 25 ppb; trans-1,2-dichloroethene at 8 ppb; and vinyl chloride at 5 ppb. GW04 exhibited a high conductivity (1,109 umhos/cm) but otherwise appeared uncontaminated. Well GW04 is screened in the same formation as the background well (GW01) which also exhibited a high conductivity.

Six more shallow wells (GW17 through GW22) were installed south and west of the French Limited site in November 1983 to better evaluate groundwater gradients and chemistry. GW17 at the far west end of the site showed 2 ppb 1,2-dichloroethane. GW18 in the Riverdale Subdivision was free of GC/MS volatile contamination. GW19, at the edge of the old Harris County landfill southeast of Riverdale, showed 23,200 ppb TOC and a conductivity of 1,731 umhos/cm, but showed no contamination in GC/MS volatile fraction. GW20, south of Gulf Pump Road near the west end of the main pit and east of the old landfill, showed a TOC of 35,800 ppb, benzene at 6 ppb, and chlorobenzene at 4 ppb. Well GW21, southwest of the lake south of Gulf Pump Road and screened through the landfill, had higher levels of contamination than GW20: 82,900 ppb TOC; 250 ppb TOX; 11 ppb benzene; 2 ppb chlorobenzene; and 2 ppb 1,2-dichloroethane. GW22, east (and upgradient) from GW21, was free of GC/MS volatile contamination.

Where are the sample results from Monitor wells GW23 & GW24

Table 4-13. Chemical Analyses on Wells Sampled in Both April and November, 1983--French Limited Site

Parameters	Units	Human Health Criteria	GW03 4/19/83	GW03 11/29/83	GW05 4/20/83	GW05 11/30/83	GW06 4/20/83	GW06 11/29/83	GW10 4/18/83	GW10 11/29/83	GW10 11/29/83	GW11 4/18/83	GW11 11/29/83
Conventional Analysis													
Carbon, TOC	ug/l		20000	21200	3400	7600	4800	5900	4300	<DL	<DL	<DL	<DL
Total Organic Halogen, TOX	ug/l		94	280	81	100	<DL	170	<DL	100	63	<DL	68
Phenols, Total	ug/l		NA	2	<DL	<DL	NA	<DL	<DL	<DL	<DL	1.0	<DL
pH*	S.U.		6.2	6.4	5.4	5.9	9.2	9.3	7.7	NA	NA	7.6	NA
Conductivity*	umhos/cm		607	615	151	175	521	493	483	NA	NA	503	NA
Metals			NA	NA		NA	NA	NA	NA	NA	NA	NA	NA
Chromium	ug/l	50			13.0								
Copper	ug/l				4.3								
Mercury	ug/l	0.144			0.3								
Lead	ug/l	50			<DL								
Zinc	ug/l				49.5								
GC/MS Volatiles			NA		<DL	<DL	NA		NA	<DL	<DL	NA	<DL
Benzene	ug/l	6.6		22				<DL					
1,1-Dichloroethane	ug/l			23				<DL					
1,2-Dichloroethane	ug/l	9.4		25				12					
T-1,2-Dichloroethene	ug/l			8				20					
Tetrachloroethene	ug/l	8.0		<DL				16					
Trichloroethene	ug/l	27		<DL				8					
Vinyl chloride	ug/l	20		5				<DL					
GC/MS Acid Fraction			NA	NA	<DL	NA	<DL	NA	NA	NA	NA	<DL	NA
GC/MS Base/Neutral			NA	NA	<DL	NA	<DL	NA	NA	NA	NA	<DL	NA
PCBs/Pesticides			NA	NA	<DL	NA	NA	NA	NA	NA	NA	NA	NA

NA = not analyzed
<DL = less than detection limit
* measured in the field

The residential wells GW10 (87 feet deep) and GW11 (52 feet deep) located in Riverdale Subdivision were sampled in both April and November 1983. Samples from both wells were analyzed by GC/MS for volatile organics in November and did not show any contamination. Well GW11 was analyzed for the GC/MS acid and base/neutral fractions in April, but nothing was detected in these samples.

4.3.3 <u>Assessment</u>

Geotechnical and chemical data indicate that ground water in the immediate pit area is heavily contaminated. South of the site this heavily contaminated area extends approximately 200 feet from the pit or just beyond Gulf Pump Road (see Figure 4-13). Groundwater wells GW08 and GW09 in this area had elevated concentrations of over a dozen volatile organic compounds similar to those found in the main pit sludges. It appears that ground water around the pit is becoming heavily contaminated through some leaching action of the main pit sludges.

Just beyond this heavily contaminated area is an area of less contaminated ground water (see Figure 4-13). Groundwater wells GW03, GW20 and GW21 all show lower concentrations of several of the same compounds seen in wells GW08 and GW09. The extent of this less contaminated area is unknown, but lies somewhere between GW21 and GW23. → GW19

The old Harris County landfill adjacent to the Riverdale Subdivision appears to have contributed contamination into the Upper Aquifer. Groundwater wells in and adjacent to the landfill, GW07 and GW19 on the west side, GW20 and GW21 on the east side, and GW23 on the south side exhibited elevated concentrations of one or more of the following: TOC, benzene, chlorobenzene, arsenic, and barium. Arsenic and barium were not found at the French Limited site and the chlorobenzene levels found at the site were minimal. These findings indicate the landfill is contributing to groundwater contamination south of the French Limited site.

→ NO values for this well

these compounds were not presented in Table 4-11

Unregulated and indiscriminate dumping of wastes in the area, both past and present, could have resulted in the dumping of some hazardous wastes in the old landfill. A Texas Department of Water Resources District 7 representative reported that standing water in the trenches at the old landfill had an oily film and a chemical odor (TDWR Memo, April 1984).

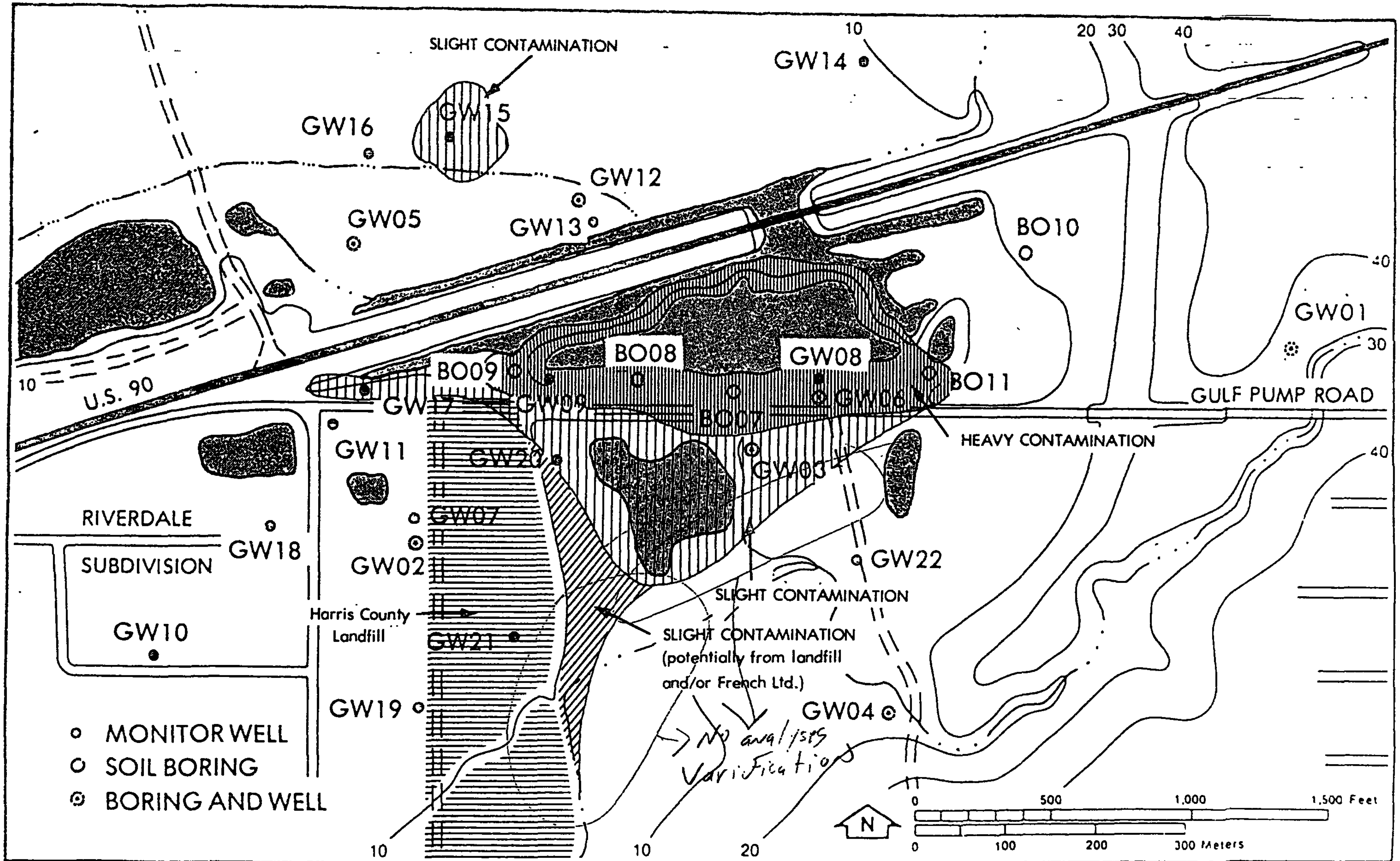

Figure 4-13
APPROXIMATE AREA OF GROUND WATER
COMTAMINATION

FRENCH LIMITED SITE

Prepared for:
TEXAS DEPARTMENT OF WATER
RESOURCES

IAn / ESE / HEA

DATE: JUNE, 1984 PROJECT NO 1633-20-C01

Two additional areas of slight groundwater contamination were found: one along the slough west of the pit and south of U.S. Highway 90, and the other northwest of the site around groundwater well GW15.

Well GW17, west of the main pit and north of Riverdale Subdivision, showed a trace of volatile organic contamination. This appears to be a result of leaching of the sludges which were in the slough west of the main pit but south of U.S. Highway 90. If this is the case, all the ground water under the slough likely contains similar contamination. The removal of sludges in 1981 has eliminated much of the original source of this contamination.

Well GW15, several hundred feet north of U.S. Highway 90 northwest of the main pit, showed traces of two volatile organic compounds similar to those found in the pit sludges. The wells closer to the main pit, GW12 and GW14, indicated no detectable organic contamination. In addition, the wells further away from the French Limited pit but closer to the Sikes Disposal Pits, GW05 and GW16, showed no organic contamination. Well GW05 did indicate some metals contamination (13 ppb chromium) when sampled in April 1983.

All of the wells in the vicinity of the site indicate the presence of TOX at levels over that of the background well GW01. Although many of the wells did not indicate contamination by specific organic compounds, the incidence of TOX in the ground water indicates probable contamination by synthetic organic compounds. At this time, however, no TOX criteria have been set for drinking water or surface water, and no concentration limit has been established for alarm levels of TOX.

In summary, heavily contaminated ground water appears to extend south of the main pit to Gulf Pump Road and up to 200 feet radially out from the pit in all other directions. Ground waters between Gulf Pump Road and the drainageway to the south (approximately 700 feet) are less contaminated. Contamination in this area, however, can not be attributed solely to the French Limited site. There are strong indications that the Harris County landfill is contributing to the groundwater contamination in this area.

There is also an area of slight groundwater contamination along the slough west of the main pit and south of U.S. Highway 90 and an unexplained pocket of slight contamination northwest of the site near GW15 (see Figure 4-13).

4.4 BATHYMETRY/SUB-BOTTOM PROFILING

4.4.1 Methodology

The French Limited pit was originally formed by the dredging of sands out of the pit. Because the pit remained filled with water during this sand mining operation, the exact depths of excavation or the pit volume are unknown. After about 1965, the pit was used for disposal of industrial waste.

A bathymetric and sub-bottom profile survey of the French Limited disposal site was conducted on April 12-14, 1983 to characterize the main waste pit morphology, determine the volume of water in the pit, and define the areal distribution and volume of sludge in the lagoon.

The survey was conducted from a small boat using a Del Norte trisponder microwave positioning system, an Esterline Angus Model PD2064 digital data logger, a Raytheon Model D719 fathometer, and a Klein Model 531 combination side-scan sonar and sub-bottom profiling system.

Horizontal positioning was accomplished using a Del Norte Trisponder microwave system. The positioning system was coupled to the digital data logger which automatically recorded the position of the boat every 30 seconds while the boat moved at speeds of 2 to 4 mph (1 to 2 m/sec). After the survey, track lines showing the boat position at all times were plotted by computer. Survey transect lines were made at sufficient spacing to provide complete coverage of the lagoon. Areas of special interest were surveyed with closely spaced track lines, and sometimes tracks were repeated to increase resolution.

The fathometer, which has an accuracy of ±0.1 foot, and the positioning system, which is accurate to ±3 feet, were calibrated the morning of the survey. The sub-bottom and side-scan sonar system are factory calibrated.

In November 1983, sediments in the main pit were sampled with a vibracore device to further evaluate sludge thicknesses. Cores C001 through C010 were collected from the main pit, while three additional cores (C011 through C013) were taken from the lake south of Gulf Pump Road to determine the appearance of sediments. Two composite samples of cores from the main pit (SE25 and SE26) were collected and chemically analyzed for pollutants. The chemical findings are discussed in Section 4.6.2.

4.4.2 Results

The bathymetric map showing water depths in the French Limited main pit is shown in Figure 4-14. The deepest area in the pit exceeded 18 feet in mid-April 1983, when the water in the pit had an approximate surface elevation of 10.6 feet above mean sea level. The average depth of water across the entire pit was 10.6 feet at the time of the survey. The pit contained approximately 24.5 million gallons of water.

Was the surface Area of the pit ever varified Intro. says ≈ 8 AC.

Two small areas at the extreme east and west ends of the pit were not included in the survey. At the east end, an area of about 0.5 acre was too shallow for the boat and survey equipment to enter. The water depth in this area was about one foot. At the far west end of the pit, a containment boom holding back floating sludge prevented measurements. The area behind this boom is about 0.15 acre, with a water depth of about 4 feet. The water volumes in these areas are included in the volume estimates above.

Sub-bottom profiler records exhibited acoustic imagery typical of extremely fine-grained sediments or highly organic sediments at the water/bottom interface. Below the interface, interbedded, unconsolidated sands were observed to depths of more than 50 feet below the lagoon surface. The records were indicative of interbedded sands or fine-grained, silty sands interspersed with thin clayey sand layers. Hydrocarbon or organic sludges appear as acoustic haze on the sub-bottom profiler record. The sludge areas detected by the sub-bottom profiler indicate that the sludge is concentrated in depressions in the lagoon bottom. The sludge is recognized as the acoustic shadow immediately above the first acoustic return from the underlying sand surface.

what records

Evaluation of acoustic records indicate that the sludge within the main pit is concentrated or pooled in the deepest areas (see Figure 4-14). Numerous sludge dumps or deposits exist around the banks at or near the water edge. In

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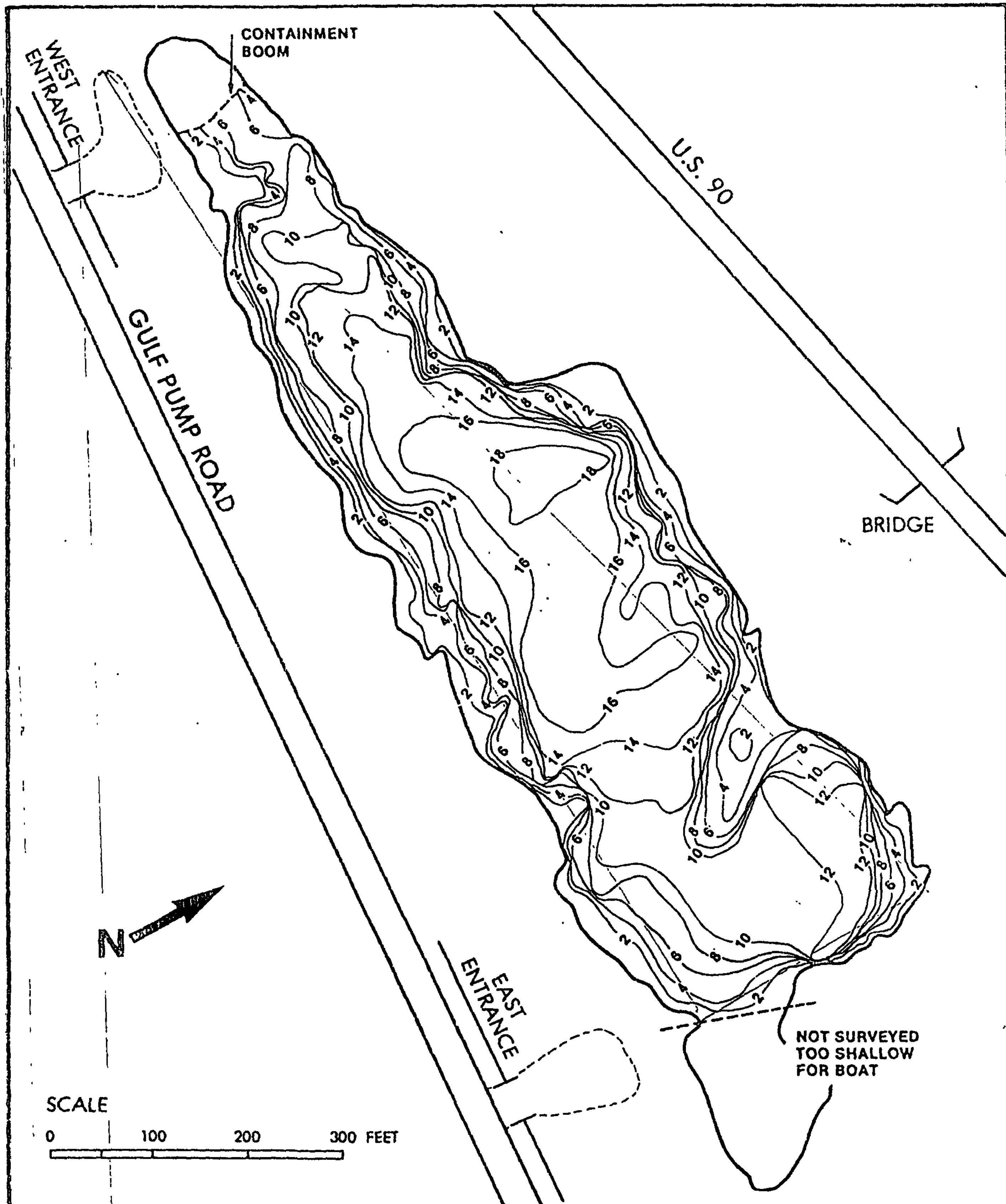


Figure 4-14
WATER DEPTHS - APRIL 1983
MAIN PIT

FRENCH LIMITED SITE

Prepared for:
TEXAS DEPARTMENT OF WATER RESOURCES

LAN / ESE / HLA

DATE: JUNE 1984 PROJECT NO. 1633-20-001

addition to the material that may have been disposed directly into the water, these deposits on the banks apparently seep or flow downgradient into the pit. The lack of significant accumulations of sludge on the submerged slopes of the pit suggests that the sludge ponds at the bottom through gravity flow. Probing with rods along the south bank near the east entrance indicated that the sediments were a high viscosity material. Sampling with a PVC pipe in April was not successful.

In November 1983, the water elevation in the main pit was about 11.6 feet above mean sea level, or about one foot higher than in April. The ten core samples (C001 through C010) taken from the main pit in November 1983 are shown in Figure 4-14. A summary of the findings at each coring station is presented in Table 4-14.

In general, the coring observations confirmed the acoustic measurements made in April 1983. However, coring at some locations (such as C003, C004, C007 and C009A) seemed to yield sludge thicknesses greater than the acoustic measurements. The acoustic measurements had no way of yielding information on the sands below the sludges. The coring at every station indicated that oily or tarry sludges appear to have penetrated the native sands, leaving them heavily stained.

Fig res. do not appear to make sense

The acoustic measurements (see the contours in Figure 4-14) made in April 1983 suggest that the main pit might contain 200,000 cubic feet of sludge material. Coring in November 1983 indicates this is a lower limit to the sludge volumes in the pit. The cores where sludge thicknesses exceeded the acoustic observations were in the central and western portions of the pit. Based upon these limited measurements, the volume of sludges could easily approach 300,000 cubic feet.

These numbers provide only a general indication of the sludge amounts in the pit, because acoustic measurements are limited by the physical differences between the sludges and the underlying sands. Since sands and sludges may have become intermixed over the years by slumping or other processes, acoustic measurements may not clearly distinguish all of the sludge deposits. Similarly, coring provided a visual means of distinguishing between the sludges and the

Table 4-14. Core Observations in Main Pit, November 1983

Station	Water Depth (ft.)	Depth/Interval (ft.)	Core Description	Acoustic Observations
C001	5	0-0.5	Tarry elastic sludge	Sludge less than 0.8-feet thick
		0.5-1.0	Tarry silty sand	
		1.0-2.0	Tarry sand	
		2.0-2.5	Dark brown sand	
C002	20	0-6	Sample not retained Pushed by hand to 6 feet; very hard layer encountered at that depth	Sludge 0.8 to 1.6 feet thick
C003	12	0-2.5	Oily liquid with hard particles	Sludge less than 0.8-feet thick
		2.5-3.0	Elastic, oily liquid	
		3.0-3.8	Rubbery, tar-like solid	
		3.8-4.0	Tarry sand	
C004	17	0-0.5	Silty, oily liquid	Sludge less than 0.8-feet thick
		0.5-1.0	Brown, silty, rubbery solid	
		1.0-4.0	Silty, oily solid (not tarry)	
		4.0-4.5	Gray, medium granular sand	
C005	20	0-2.0	Black stringy tar	Sludge about 2-feet thick
		2.0-4.0	Tarry black/gray sand	
		4.0-4.5	Gray sand	
C006	18	0-0.5	Black tar	Sludge less than 0.8-feet thick
		0.5-4.5	Brown sandy tar	
C007		0-0.5	Liquid sludge	Sludge less than 0.8-feet thick
		0.5-1.8	Semi-liquid; firmer at bottom	
		1.8-2.0	Gelatinous sludge with hard globules	
		2.0-2.3	Dark gray gelatin	
		2.3-2.6	Gray sand	
C008	17	0-1.0	Oily colloidal sludge	Sludge less than 0.8-feet thick
		1.0-1.5	Gray gravelly sand	
C009A	20	0-4.0	Black/brown tarry sludge	Sludge about 3 to 4-feet thick
		4.0-5.5	Brown silty tar	
		5.5-5.7	Gray/black sand	

Table 4-14. Core Observations in Main Pit, November 1983
(Continued, Page 2 of 2)

Station	Water Depth (ft.)	Depth/Interval (ft.)	Core Description	Acoustic Observations
C009B	19	0-2.5	Soupy black oily sludge	Sludge about 3 to 4-feet thick
		2.5-3.5	Black globule sludge with silt and rubbery solids	
		3.5-3.7	Gray/black sand	
C010	20	0-2.0	Black oily sludge with globules	Sludge about 2-feet thick
		2.0-3.0	Dark gray clayey tar with intermixed stringy tar	

underlying native sands. However, coring yielded information limited to only those ten sites. Volume calculations based upon only those ten sites are general estimates at best.

Should more coring be done, What is the percentage of error with current est.

Since almost every coring station indicated 1 to 4 feet (see Table 4-14) of heavily contaminated sands beneath the sludges, there could be substantial quantities of this material beneath the sludges. Given the area of the main pit, there could be 500,000 to 1,000,000 cubic feet of oil- and tar-contaminated sands beneath the sludges in the pit.

Three cores were collected with the vibracore from the lake south of Gulf Pump Road. These cores (CO11 through CO13) are described in Table 4-15. The locations of these cores are shown in Figure 4-15. The black gelatinous liquid layer exhibited an organic chemical odor at the time of coring. Sediment samples SO06 and SE22 were collected from this lake for chemical analysis, with these results being presented in Section 4.6.2.

4.5 SURFACE WATER/PIT WASTEWATER SAMPLING

4.5.1 Surface Water/Pit Wastewater Site Selection and Sampling Methodology

Pit Wastewater

Four surface water and six wastewater samples were collected for analysis from sites identified in Table 4-16. In April 1983, samples SW01 and SW02 were collected from the waste pit at levels 1 to 1.5 meters above the pit bottom. SW01 and SW02 represent composites of samples collected along lines that transverse the waste pit (Figure 4-16). Four aliquots were obtained from distinct points along the transverse line and then composited. Each aliquot was obtained by lowering Teflon tubing to the desired depth and sampling with a peristaltic pump operating on low speeds.

In addition to the preceding lagoon wastewater samples, a survey was done in April 1983 to determine water stratification in the waste pit. Conductivity, dissolved oxygen, pH and temperature were measured at two linear transects (north-south) corresponding with SW01 and SW02. Parameters were measured at four points along each transect. Results from the water stratification survey indicate dissolved oxygen stratification but no pH, conductivity, or temperature stratification (Table 4-17). The dissolved oxygen chemocline

Table 4-15. Core Observations in Lake South of Gulf Pump Road, November 1983

Station	Water Depth (ft.)	Depth/Interval (ft.)	Core Description
C011	15	0-2.0	Black Gelatinous liquid
		2.0-3.7	Black silt with more coarse sand at bottom
		3.7-4.0	Light gray sand
C012	17	0-0.5	Black gelatinous liquid
		0.5-3.0	Black silt changing to silty sand, then gray sand near bottom
		3.0-3.4	Coarse brown sand with gravel
C013	16	0-0.2	Black liquid
		0.2-0.7	Dark sand
		0.7-1.0	Brown coarse sand

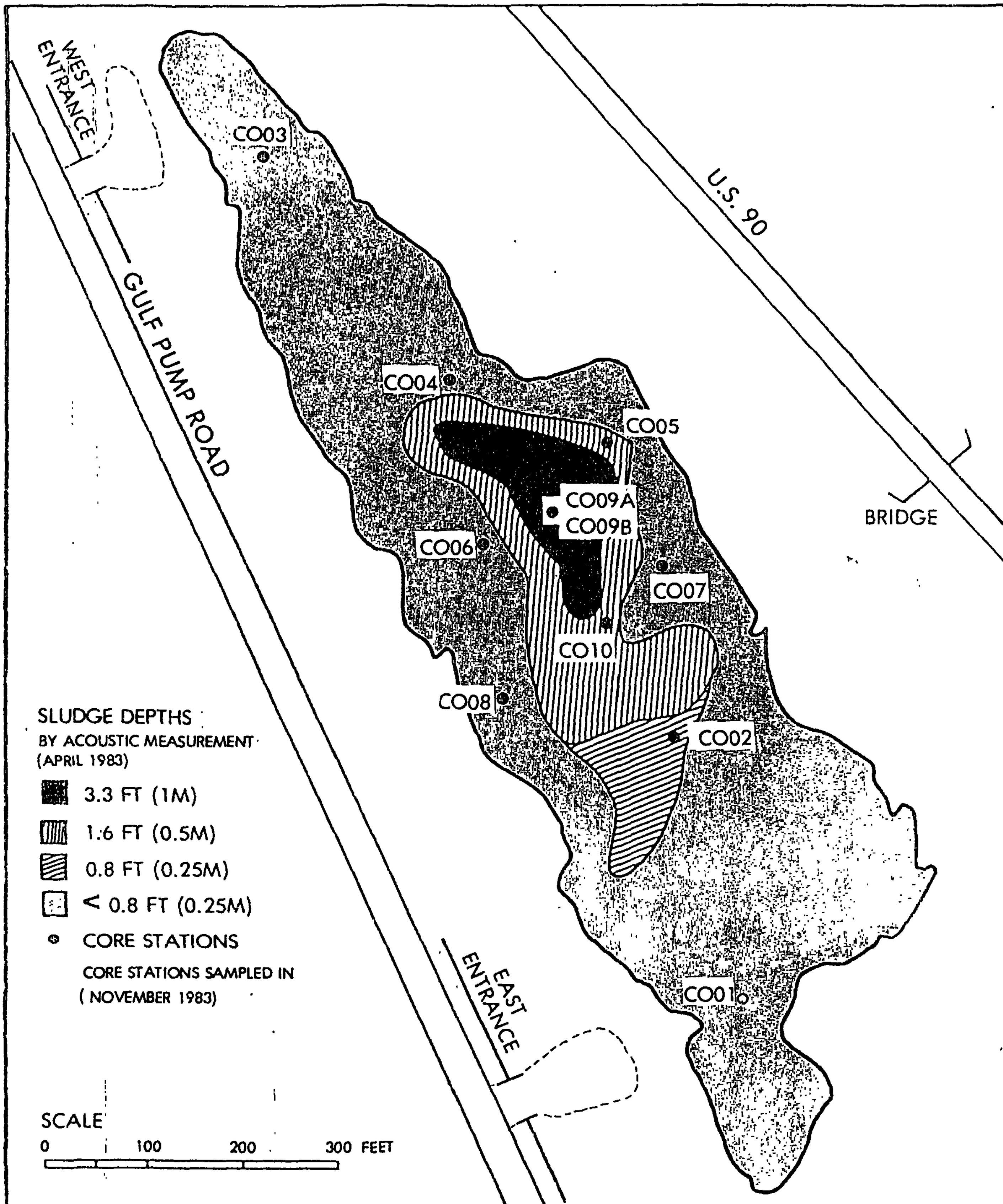


Figure 4-15 SLUDGE THICKNESSES - MAIN PIT	FRENCH LIMITED SITE	Prepared for: TEXAS DEPARTMENT OF WATER RESOURCES lan / ESE / HLA DATE: JUNE, 1984 · PROJECT NO. 1633-20-001

Table 4-16. Surface Water Sample Sites

Site Number	Rationale
SW01	Composite sample from eastern end of waste pit at a 2 to 6 foot depth
SW02	Composite sample from western end of waste pit at a 3 to 10 feet depth
SW03	Grab sample from abandoned sand pit east of the main waste pit
SW04	Grab sample from abandoned sand pit south of the main waste pit
SW05	Grab sample from slough north and west of the main waste pit
SW06	Grab sample from fishing hole beneath U.S. Highway 90 bridge
SWMAPT	Survey to determine any stratification of pH, conductivity, or dissolved oxygen in main waste pit
SW07, 08, 09	Samples from top, middle and bottom water layers at the center of the main waste pit

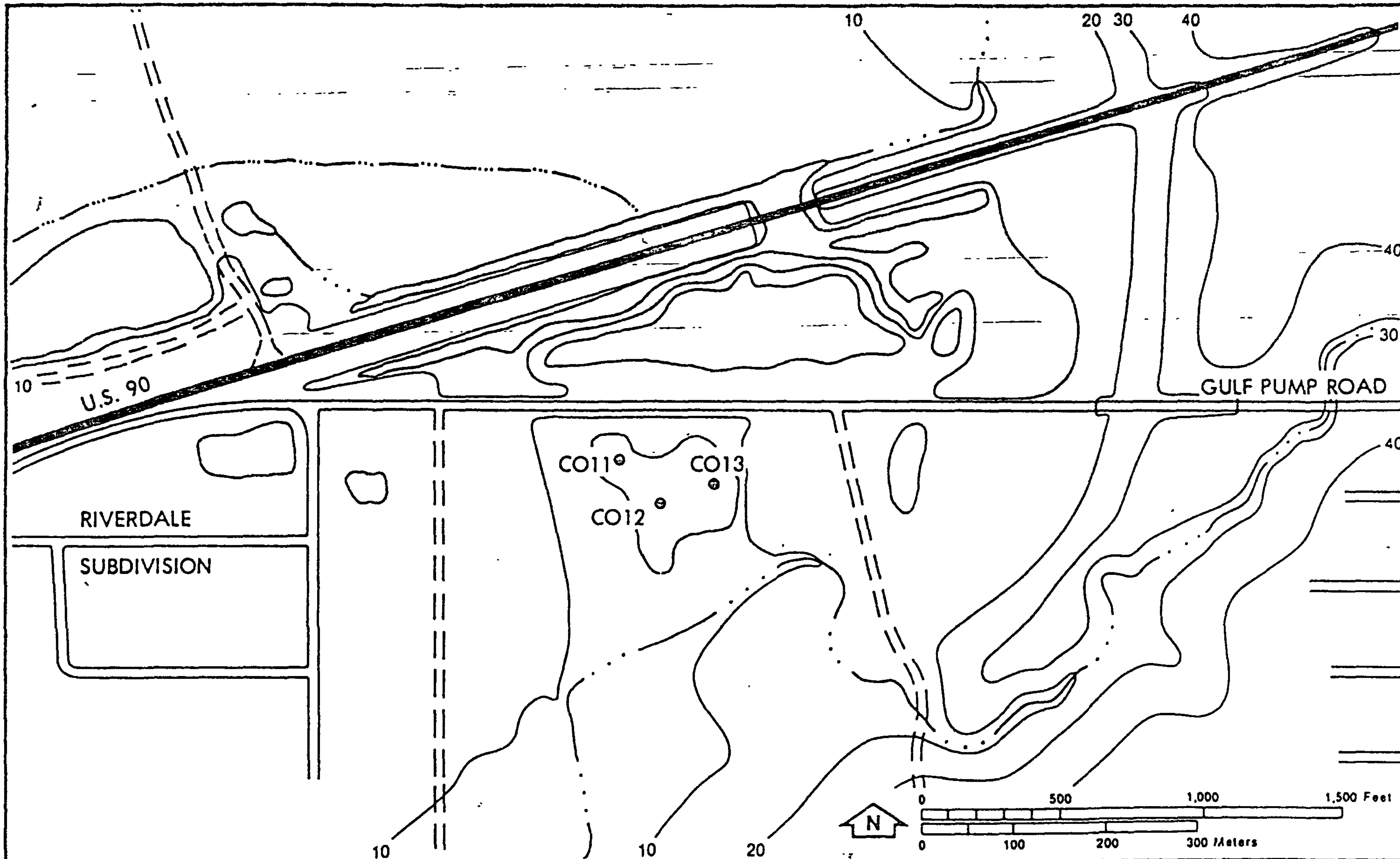


Figure 4-16
CORE LOCATIONS - LAKE SOUTH OF SITE

FRENCH LIMITED SITE

Prepared for:
TEXAS DEPARTMENT OF WATER RESOURCES

ESE / HLA

DATE: JUNE, 1984 PROJECT NO. 1633-70-001

Table 4-17. French Limited Main Pit Stratification Survey Results
April, 1983

Site/ Depth (ft.)	Station 1 Temp. (°C)	Station 1 pH	Station 1 Conductivity (umhos/cm)	Station 1 D.O. (ppm)	Station 2 Temp. (°C)	Station 2 pH	Station 2 Conductivity (umhos/cm)	Station 2 D.O. (ppm)	Station 3 Temp. (°C)	Station 3 pH	Station 3 Conductivity (umhos/cm)	Station 3 D.O. (ppm)	Station 4 Temp. (°C)	Station 4 pH	Station 4 Conductivity (umhos/cm)	Station 4 D.O. (ppm)
Sample SW01																
1.6	20.0	8.0	445	8.7	19.6	8.2	443	8.8	19.7	8.3	443	8.8	19.7	8.3	443	8.9
6.6	19.4	7.9	445	8.5	19.2	8.1	443	8.0	19.2	8.1	443	8.1	19.2	8.1	444	8.2
10.0	17.6	7.7	460	4.4	16.8	7.9	463	3.7	16.4	7.7	482	2.0	16.2	7.5	482	1.8
Sample SW02																
1.6	20.5	8.4	447	8.3	20.8	7.9	445	7.7	20.9	8.1	445	—	20.8	8.0	446	—
3.3	20.4	8.1	447	—	20.6	7.6	446	—	—	—	—	—	—	—	—	—
5.0	—	—	—	—	—	—	—	—	20.7	8.0	445	—	20.5	7.9	445	—
6.6	—	—	—	—	20.1	7.2	445	—	—	—	—	—	—	—	—	—
8.2	—	—	—	—	—	—	—	—	19.2	7.6	447	—	18.8	7.7	449	—
Sample SWMAPT																
1.6	20.4	8.4	445	8.8												
3.3	20.3	8.4	445	8.8												
5.0	20.1	8.3	444	8.7												
6.6	19.6	8.2	444	8.4												
8.2	17.9	8.1	444	7.5												
10.0	16.9	7.9	447	6.1												
11.5	15.3	7.4	476	1.2												
13.0	14.3	7.3	494	0.1												
15.0	13.9	7.3	505	0.2												
16.5	13.8	7.3	506	0.2												
18.0	13.7	7.2	510	0.2												

occurred at 10 to 12 feet. Vertical profiles consisted of surface, mid-depth and bottom measurements at these points. A single vertical profile was taken at the center of the main pit (SWMAPT) at 1.5-foot intervals.

In November 1983, three more pit wastewater samples (SW07, SW08 and SW09) were collected from the same location in the center of the main pit. These samples were collected with a peristaltic pump and Teflon tubing lowered to depths of 2-, 9-, and 17-feet below the pit surface.

Surface Water

In addition to wastewater samples taken from the French Limited pit, four surface water samples were taken from area ponds and drainageways. Sample SW03 was a grab sample taken from the abandoned sand pit immediately east of the main waste pit. Sample SW04 was a grab sample taken in the pond (abandoned sand pit) south of Gulf Pump Road. Sample SW05 was a grab sample taken from the swampy drainageway north of U.S. Highway 90. Sample SW06 was a grab sample taken in the "fishing hole" beneath the U.S. Highway 90 bridge.

4.5.2 Chemical Results--Surface Water and Pit Wastewater

The conventional analyses (primarily indicator parameters) of surface waters from the French Limited site vicinity are shown in Table 4-18. The analyses for metals, PCBs, pesticides, and GC/MS fractions are summarized in Table 4-19.

Pit wastewater samples SW01 and SW02 were taken from the main pit, and both exhibited traces of phenols (see Table 4-18). All three wastewater samples from the main pit (SW01, SW02 and SWMAPT) exhibited elevated TOC levels (62,000 to 62,700 ppb). The three wastewater samples collected in November 1983 (SW07 through SW09) generally showed increasing contamination at greater depths. The sample taken from a 2-foot depth (SW07) contained 19,100 ppb TOC and 110 ppb TOX. SW08, taken 9-feet deep, showed 28,700 ppb TOC, 77 ppb TOX, and showed two base/neutral fraction chemicals above detection limits [bis(2-ethylhexyl)phthalate at 3 ppb and di-N-butyl-phthalate at 2 ppb]. The deepest sample, taken from 17 feet (SW09), exhibited a bluish tint at the time of collection, and showed 534,000 ppb TOC and 160 ppb TOX. This sample was free of pesticides and GC/MS acid fraction pollutants, but contained numerous

Table 4-18. French Limited Surface Water and Lagoon Water Chemical Analysis Results

Parameters	Units	Human Health Criteria	Incidence	Range	SW01	SWAPT	SW02	SW03	SW03D	SW04	SW05	SW06	SW07	SW08	SW09
Date Collected	—	—	—	—	←April 14-16, 1983							→	←November 26, 1983		→
Depth (feet)					1-10	1-18	1-8	1-10	1-10	3-16	1-3	1-3	2	9	17
Conventional Analysis															
Carbon, TOC	ug/l		11/11	10200-534000	62200	62000	62700	12300	10200	12200	35700	12200	19100	28700	534000
TOX	ug/l		5/11	58-66	<DL	66	58	<DL	<DL	<DL	<DL	<DL	110	77	160
Phenols	ug/l	3,500	9/10	2-34	13	NA	34	2	4	4	10	3	<DL	3	5
pH*	S.U.			5.0-8.4	8.0	8.4	7.7	7.1	7.1	6.9	7.2	7.1	5.0†	5.0†	5.0†
Conductivity*	umhos/cm			355-453	453	445	446	392	392	355	400	305	120	120	430
Temperature*	°C			18.4-21.0	18.4	20.4	20.3	18.6	18.6	17.8	21.0	20.2	19.0	19.0	19.0
Dissolved Oxygen	mg/l				6.7	8.8	—	—	—	—	—	—	—	—	—

* Average Values.
† Reading taken with pH paper, all others with pH electrode.

NA = not analyzed.
<DL = less than detection limit (see Appendix I).
mg/l = ppm.
ug/l = ppb.

Table 4-19. French Limited Surface and Lagoon Water Chemical Analysis Results

Parameters	Units	Human Health Criteria	Incidence	Range	SW01	SW02	SW04	SW05	SW06	SW08	SW09
Date Collected	--	--	--	--	<------------------April 14-16, 1983------------------>					<--November 26, 1983-->	
Depth/Range	feet	--	--	--	1-10	1-8	3-16	1-3	1-3	9	17
Metals						NA		NA		NA	NA
Chromium	ug/l	50	2/3	10.0-11.0	13		10		11		
Copper	ug/l		3/3	5.6-6.6	6.2		5.6		6.6		
Mercury	ug/l	2.0	2/3	0.3	<DL		0.3		0.3		
Zinc	ug/l		3/3	13.2-17.9	13.2		16.8		17.9		
Pesticides										<DL	<DL
BHC,G (Lindane)	ug/l	0.186	4/7	0.003-0.045	0.003	0.003	0.045	0.005			
GC/MS Volatiles						NA	<DL	NA	<DL	<DL	
Benzene	ug/l	6.6	2/5	2-1500	2						1500
Chloroform	ug/l	1.9	2/5	3-390	3						390
1,1-dichloroethane	ug/l		2/5	2-210	2						210
1,2-dichloroethane	ug/l	9.4	2/5	4-190	4						190
1,1-dichloroethene	ug/l	0.33	1/5	13	<DL						13
T-1,2-dichloroethene	ug/l		1/5	350	<DL						350
1,2-dichloropropane	ug/l	87	1/5	17	<DL						17
Ethylbenzene	ug/l	1,400	1/5	580	<DL						580
Tetrachloroethene	ug/l	8	1/5	63	<DL						63
Trichloroethene	ug/l	27	1/5	110	<DL						110
Toluene	ug/l	14,300	1/5	410	<DL						410
Vinyl chloride	ug/l	20	2/5	2-180	2						180
GC/MS Acid Fraction			0/5		<DL	NA	<DL	NA	<DL	<DL	<DL
GC/MS Base/Neutral					<DL	NA	<DL	NA	<DL		
Acenaphthene	ug/l	20	1/5	260						<DL	260
Acenaphthylene	ug/l		1/5	240						<DL	240
Anthracene	ug/l	0.028	1/5	220						<DL	220
Benzo(A)anthracene	ug/l	0.028	1/5	280						<DL	280
Bis(2-ethylhexyl) phthalate	ug/l	15000	2/5	3-390						3	390
Chrysene	ug/l		1/5	170						<DL	170
Di-N-butyl-phthalate	ug/l		1/5	2						2	<DL
Fluoranthene	ug/l	42	1/5	630						<DL	630
Fluorene	ug/l	0.028	1/5	570						<DL	570
Naphthalene	ug/l		1/5	720						<DL	720
Phenanthrene	ug/l	0.028	1/5	1300						<DL	1300
Pyrene	ug/l	0.028	1/5	740						<DL	740

NA = not analyzed.
<DL = less than detection limit (see Appendix I).
mg/kg = ppm.

GC/MS volatile and base/neutral fraction pollutants (see Table 4-19). Benzene was found at 1,500 ppb or more than 200 times above the human health criterion in SW09.

Other volatile organic compounds found in SW09 were: chloroform (390 ppb); 1,2-dichloroethane (190 ppb); 1,1-dichloroethylene (13 ppb); tetrachloroethene (63 ppb); trichloroethene (110 ppb); and vinyl chloride (180 ppb). SW09 contained high part per billion levels of several polynuclear aromatic hydrocarbons (detected by the base/neutral fraction), including: anthracene at 220 ppb, benzo(A)anthracene at 280 ppb, fluoranthene at 630 ppb, chrysene at 170 ppb, fluorene at 570 ppb, phenanthrene at 1,300 ppb, and pyrene at 740 ppb. The total of these polynuclear aromatics (PNA's) is about 3.3 ppm, which is over 100,000 times above the 10^{-5} incremental cancer risk criterion of 0.028 ppb for PNA's. In shallower waters, chloroform was detected in sample SW01 at a level of 3.0 ppb, which exceeds the human health criteria of 1.9 ppb. Other volatiles found in SW01 include: benzene (2.0 ppb), 1,1- and 1,2-dichloroethane (2.0 and 4.0 ppb) and vinyl chloride (2.0 ppb). The GC/MS acid and base/neutral fractions were less than the detection limit in SW01.

Table 4-18 indicates a change in pH and conductivity values from the April to November sampling. The overall reductions of these parameters reflect the effects the May 1983 flood had on the lagoons waters. The large dilution of lagoon waste waters by surface water during the flood can account for variance seen between the two sampling periods. (Note: November pH readings were taken using pH paper, all others with a pH electrode.)

In the surface waters north of the main pit, the analysis of SW05 showed TOC (35,700 ppb) that was triple that of SW03 from the abandoned sand pit east of the main pit (12,300 ppb) and SW06 from the "fishing hole" beneath the U.S. Highway 90 bridge (12,200 ppb). The GC/MS analysis for volatiles in SW06 was observed to be less than the detection limit, however, metals analysis indicated the presence of chromium (11 ppb), copper (6.6 ppb), mercury (0.3 ppb) and zinc (17.9 ppb).

Surface water sample SW04 taken in the abandoned sand pit south of the site showed a TOC of 12,200 ppb, no detectable TOX, and nothing in the GC/MS volatile, acid and base/neutral fractions above the the detection limit.

Like SW06, surface water sample SW04 indicated the presence of chromium (10 ppb), copper (5.6 ppb), mercury (0.3 ppb), and zinc (16.8 ppb). These metals, particularly the chromium and zinc are present in SW04 and SW06 in similar proportions as those seen in the main pit sludges.

The surface water sample SW04 from the lake south of the main pit exhibited traces of the pesticide Lindane (0.045 ppb), but was free of volatile organic compounds. The pesticide is not at a significant level (the 10^{-5} incremental cancer risk criterion is 0.186 ppb) and may be due to sources external to the French Limited site.

4.5.3 Pit Wastewater and Surface Water Assessment

Water contamination in the main pit appears to be quite low over the shallower depths (i.e. less than 15 feet). However, seasonal changes appear to significantly affect the concentrations of volatile organic contaminants in the upper water layers. Surface water sample SW01 taken in April indicated the presence of trace concentrations of five volatile organic contaminants, while sample SW08 taken in November indicated no volatile organics. This observation could be attributed to the net temperature differences between April and November (approximately 20°F). The cooler November temperatures reduce the solubility of most organic compounds in water, reduce the partition coefficient between sediments and water, and reduces the rate of volatilization from sediments/sludges into the air. Wastewater sampled in November along the bottom of the pit was highly contaminated with volatile organic and base neutral compounds. Sample SW09 appeared to have a much higher suspended solids concentration than SW01 (based on a visual comparison). The presence of high concentration of base neutral compounds in SW09 and not SW01 could be due to the high suspended solids concentration in SW09. Also the upper water layers of the waste pit generally have a lower suspended solids concentration than the lower layers due to the gravitational settling of the solids. Therefore, the concentration of contaminants in the waters of the main pit is clearly affected by the concentration levels inthe sludges and sediments, the ambient temperations of the sediment/water/air interface, and any disturbance which might interrupt the sedimentation process in the pit.

The waters outside the main pit do not appear to be contaminated with orgainc contaminants. This can be attributed to the lack of surface pathways connecting the different bodies of water. Runoff during non-flood periods is virtually non-existent. Evaporation and infiltration into the ground water appear to be the two dominant pathways for outflow from the main pit and other pits, marshes and sloughs in the site. The presence of metals contamination in the "fishing hole" adjacent to the main waste pit appears to be an indication of the proposed pathway.

4.6 SEDIMENT SAMPLING

4.6.1 Sediment Sampling Site Selection and Sampling Methodology

Eleven sediment samples (SE01 through SE10) were collected in April 1983, and nineteen more (SE11 through SE29) were taken in November 1983, using either a Ponar sampler, post-hole digger, shovel or vibracorer depending on depth of water and sediment conditions. A summary of these sampling sites is presented in Table 4-20. Sampling tools were thoroughly cleaned and rinsed between sampling locations by first rinsing with water and subsequently rinsing with hexane followed by acetone. After the acetone rinse, the tool was rinsed with distilled water and allowed to dry. The first grab at each location was discarded as a further cleaning step. Lexan or PVC pipe used with the vibracore sampler was discarded after each sample was obtained. Depth of sediments sampled was 2 to 6 inches (0.05 to 0.2 meters). Sediments were composited from three to four subsamples at each location. At ponds or defined drainageways, subsamples were collected across a transect as shown in Figure 4-17.

4.6.2 Chemical Results--Sediments

Selected sediment samples were analyzed for metals. These results are presented in Table 4-21. Samples from the main pit (SE01 and SE03) contained elevated levels of almost all metals relative to sites outside the pit. One sample from the slough north of the pit (SE06) was analyzed for metals and showed nothing significant. The sample taken in the abandoned sand pit east of the main waste pit (SE04) did not show significant levels of metals. The ditch

Table 4-20. Sediment Sample Site, French Limited Site

Site Number	Rationale
April 1983 Sampling	
SE01, 02, 03	Composite samples taken on north-south transect from east, center, and west zones of main waste pit.
SE04	Composite sample taken on east-west transect from abandoned sand pit east of main waste pit.
SE05	Composite sample taken on north-south transect from slough north and west of main waste pit and south of U.S. Highway 90 near bridge.
SE06	Composite of samples taken on north-south transect from slough north and west of main waste pit and south of U.S. Highway 90 near west end.
SE07	Composite of samples taken on north-south transect from "fishing hole" under U.S. Highway 90 bridge.
SE08	Sample taken from centerline of slough north of U.S. Highway 90 approximately 100 feet west of bridge.
SE09	Sample from drainage ditch approximately 80 feet south of Gulf Pump Road and east of Riverdale.
SE10	Composite sample taken on east-west transect from slough between main waste pit and Gulf Pump Road.
SO06	Composite sample taken on north-south transect from abandoned sand pit south of Gulf Pump Road.
November 1983 Sampling	
SE11	Composite of samples taken from slough south of U.S. Highway 90 along a cross section near west end of the slough.
SE12	Composite of samples taken from slough south of U.S. Highway 90 along a cross section near previous sample site SE05.
SE13	Composite of samples taken from slough south of U.S. Highway 90 along a cross section near bridge.
SE14	Sediment core sample taken at 6 to 12 inch depth at sample site SE13.

Table 4-20. Sediment Sample Site, French Limited Site (Continued, Page 2 of 2)

Site Number	Rationale
SE15	Composite of samples taken from slough north of U.S. Highway 90 along a cross section northeast end of slough.
SE16	Sediment core sample taken at 6 to 12 inch depth at sample site SE15.
SE17, 18, 19	Composite of samples taken from slough north of U.S. Highway 90 along cross sections. Sample sites regularly spaced between U.S. Highway 90 bridge and west end of slough.
SE20, 21	Samples taken from approximate centerline of swampy drainageway north of U.S. Highway 90.
SE22	Composite of sample taken from the abandoned sand pit south of Gulf Pump Road along an east-west transect.
SE23, 24	Samples taken from centerline major drainageway south of Gulf Pump Road.
SE25, 26	Composite over depth of sediment cores, C009B and C010, taken in main waste pit during verification of sludge depths.
SE27	Composite of samples taken from the pond south of Gulf Pump Road near existing groundwater wells GW02 and GW07. Sample taken along a north-south transect.
SE28	Composite of samples taken from the pond at southwest corner of Gulf Pump Road and Maple Drive. Sample to be taken along an east-west transect.
SE29	Composite of samples taken from Rickett Lake along a north-south transect.

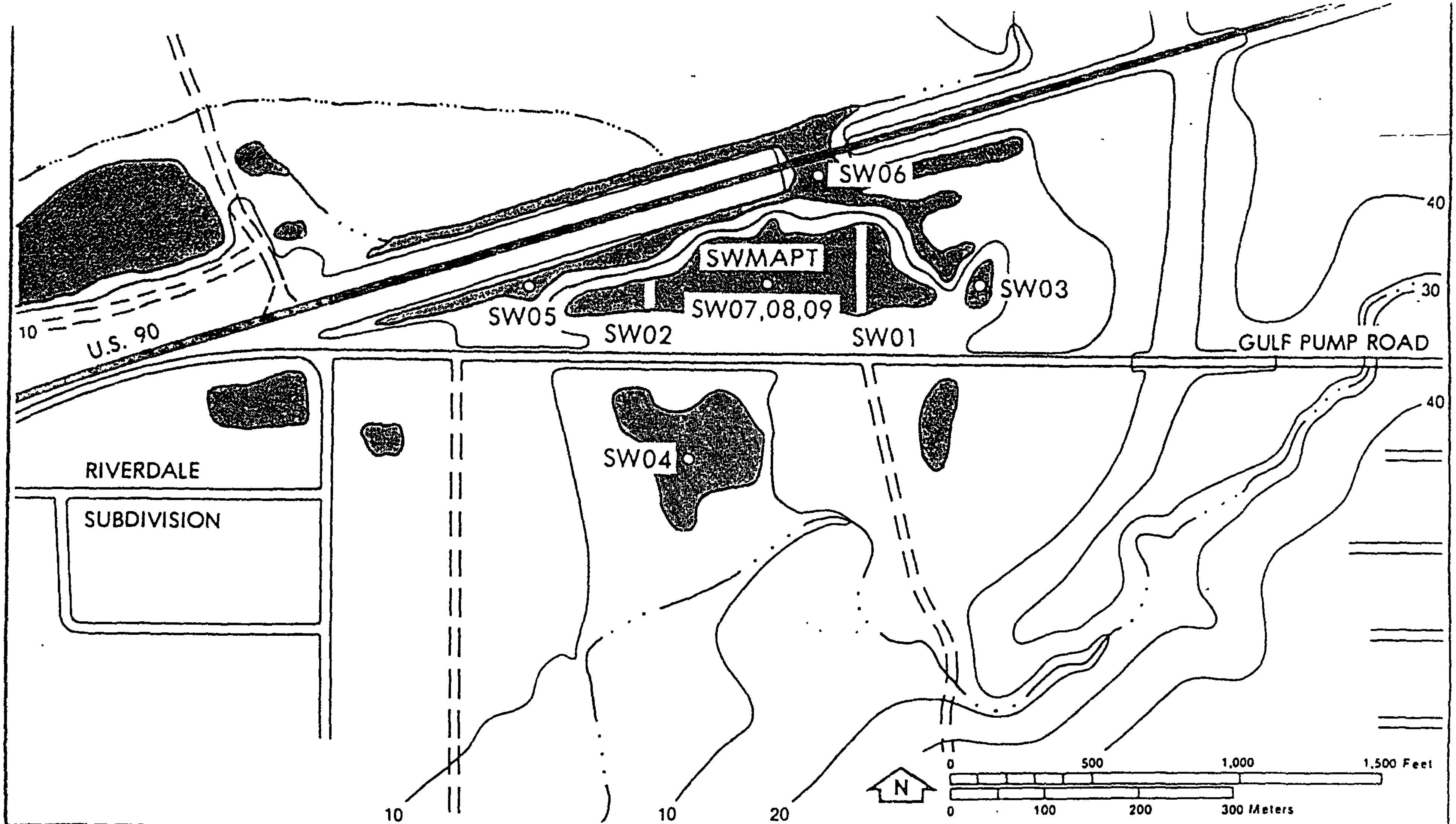


Figure 4-17
SURFACE AND LAGOON WATER SAMPLING LOCATIONS

FRENCH LIMITED SITE

Prepared for:
TEXAS DEPARTMENT OF WATER RESOURCES

DATE: JUNE, 1984 PROJECT NO. 1633-20-001

Table 4-21. French Limited Sediments Chemical Analysis Results
April, 1983

Parameters	Units	Incidence	Range	SE01	SE01D	SE02	SE03	SE04	SE05	SE06	SE07	SE08	SE09	SE10	SX06	SX06D
Metals						NA			NA		NA	NA	NA		NA	NA
Arsenic	mg/kg dry	5/5	0.1-9.9	9.9	6.3		3.5	0.1		1.4				0.9		
Berylium	mg/kg dry	5/5	0.5-51.6	51.6	39.0		13.1	0.5		7.3				6.8		
Cadmium	mg/kg dry	4/5	0.2-7.6	7.7	5.0		4.7	<DL		0.2				0.3		
Chromium	mg/kg dry	5/5	1.3-486	486	297		292	1.3		13.0				18.2		
Copper	mg/kg dry	5/5	0.7-150	83	85		150	0.7		5.0				12.0		
Mercury	mg/kg dry	1/5	0.26	<DL	<DL		<DL	<DL		0.26				<DL		
Nickel	mg/kg dry	5/5	0.9-592	592	533		92	0.9		10.0				15.0		
Lead	mg/kg dry	5/5	3.7-120	120	98.1		101	3.7		21.5				35.1		
Selenium	mg/kg dry	3/5	0.2-0.7	0.7	0.7		0.6	0.2		<DL				<DL		
Silver	mg/kg dry	5/5	0.01-0.3	0.3	0.2		0.1	0.01		0.02				0.02		
Zinc	mg/kg dry	5/5	6.0-8530	8530	6620		1070	6.0		68.0				99.0		

NA = not analyzed.
<DL = less than detection limit (see Appendix J).
mg/kg = ppm.

south of the main pit (SE10) was also free of unusual metals contamination. The location of all sediment sites is shown in Figures 4-17 and 4-18.

The highest levels of organic contamination in sediment samples occurred in the main pit (see Table 4-22). Samples SE01, SE02, and SE03 reflect the composition of the top 4 to 6 inches of sediment layers in April 1983. Samples SE25 and SE26 were composited over depth in November 1983 from vibracore samples (C009 and C010) and thus reflect a vertical average composition in the center of the pit. High levels of GC/MS base/neutral fraction compounds were seen in both April and November in all the samples, SE01, SE02, SE03, SE25 and SE26. Naphthalene (8,700 ppm in SE25) and phenanthrene (8,300 ppm) were the highest concentrations observed in the base/neutral fraction. Sediments SE25 and SE26 were analyzed for the GC/MS volatile fraction, and showed benzene at 1,100 ppm in SE25 and high ppm levels of over a dozen other compounds. Total extractable organics (TOE) in the main pit sediments ranged from 7,880 ppm to 92,600 ppm. Phenols, TOX, and TOC were also high in these samples. SE03 contained PCBs at 507 ppm, but the other samples were less than 100 ppm.

Sediment sample SE25 was further analyzed to determine the GC/MS volatile fraction content in the "head space" air over the solid portion of the sample. For this procedure, a small portion of the sediment (in this case 3.29 grams) was transferred and then sealed into a standard 40 ml VOA bottle. A small volume of gas from the head space (5 ml) was later injected into the GC column for analysis. The gas content is shown in Table 4-23. The head space analysis detected everything found in the solid sample, plus low levels of five other volatile compounds: chloroethane (4 ppm); methylene chloride (1 ppm); 1,1-dichloroethene (3 ppm); 1,1,1-trichloroethane (0.7 ppm) and 1,2-dichloropropane (0.4 ppm). For the ten volatile compounds found in both samples, the levels in the head space analysis correlated well with levels in the solid matrix.

The slough north of the main pit also contained significant yet lower levels of the same organic contamination found in the main pit sludge/sediments (see Table 4-22). TOE in SE05 was 91,400 ppm, while TOE in all the other samples taken in the slough ranged from 209 ppm to 14,700 ppm. TOC concentrations ranged from a high of 49,100 ppm (SE11) to a low of 2,730 ppm (SE14). PCBs

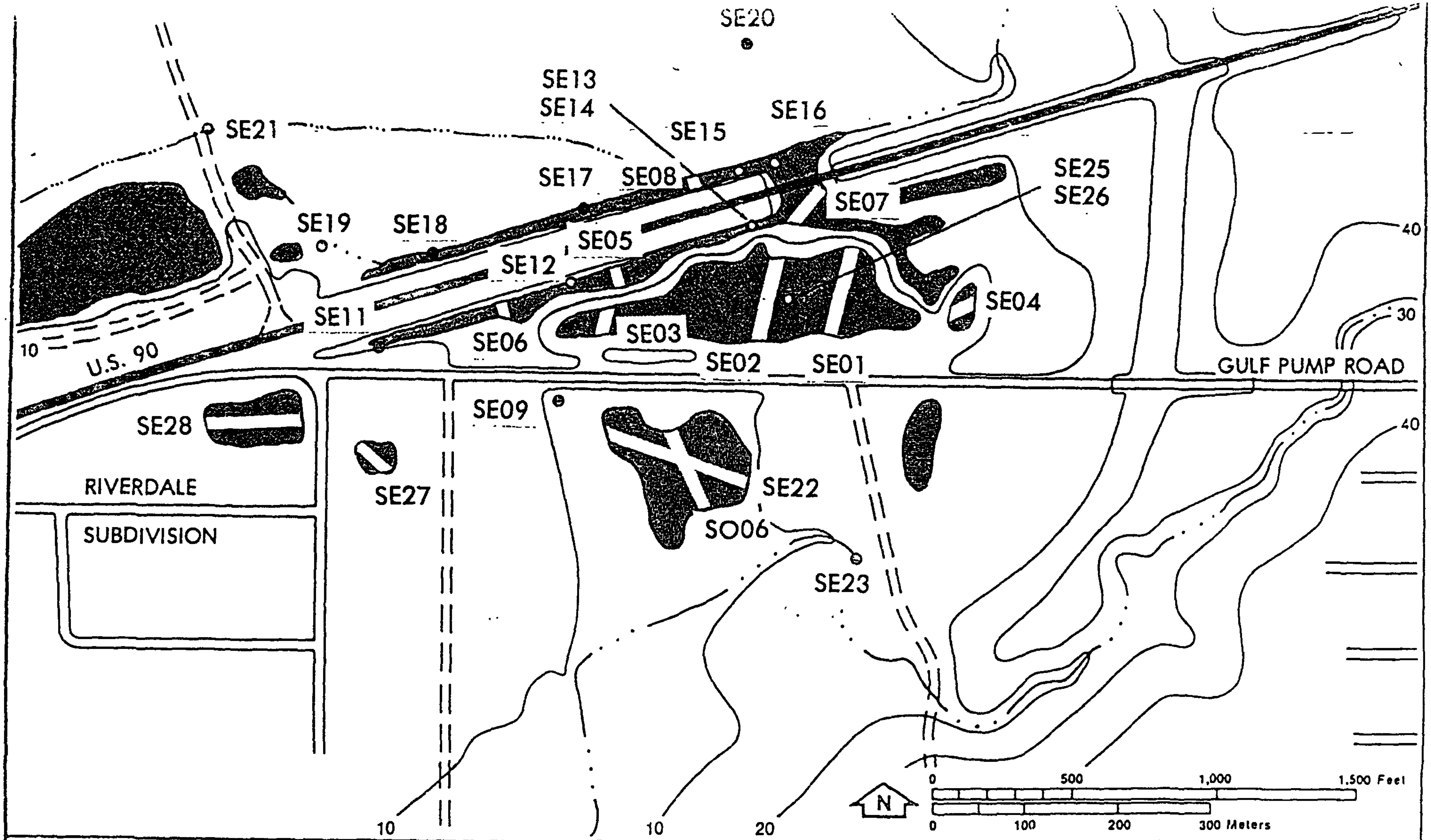


Figure 4-18
SEDIMENT SAMPLING LOCATIONS

FRENCH LIMITED SITE

Prepared for:
TEXAS DEPARTMENT OF WATER RESOURCES

ESE

DATE: JUNE. 1984 PROJECT NO.

Table 4-22. French Limited Sediments Chemical Analysis Results

Parameters Date Collected:	Units	MAIN WASTE PIT SE01	 SE01D	 SE02	 SE03	 SE25	 SE26	SLOUGH NORTH OF MAIN PIT SE05	 SE06	 SE07	 SE11	 SE12	 SE13	 SE14
		<---------April 1983---------->				<-Nov. 1983->		<----April 1983----->			<--------November 1983-------->			
Conventional Analysis														
Solids	% Wet	12.2	14.1	28.2	20.0	24.2	38.1	55.4	48.1	19.2	31.8	37.3	43.5	68.4
Carbon TOC	g/kg dry	383	44.5	38.4	179	115	66.6	31.9	11.0	5.40	49.1	22.3	8.44	2.73
TOX	mg/kg dry	633	535	239	241	170	51	38	36.6	8.63	14	6.1	2.0	1.6
TOE	mg/kg wet	10200	7880	31400	92600	30300	68900	91400	602	209	4120	14700	1060	1960
Phenol	mg/kg dry	31	24	8	23	NA	NA	1.7	2.6	<DL	NA	NA	NA	NA
GC/MS Volatiles		NA	NA	NA	NA			NA	NA	NA	NA	NA	NA	
Benzene	mg/kg dry					270	120							0.27
Chlorobenzene	mg/kg dry					<DL	3							
Chloroform	mg/kg dry					230	55							
1,1-Dichloroethane	mg/kg dry					39	150							
1,2-Dichloroethane	mg/kg dry					230	348							
1,1-Dichloroethene	mg/kg dry					<DL	1.8							
T-1,2-Dichloroethene	mg/kg dry					77	200							
1,2-Dichloropropane	mg/kg dry						100							
Ethylbenzene	mg/kg dry					87	39							0.20
Methylene chloride	mg/kg dry					<DL	170							
Tetrachloroethene	mg/kg dry					120	6							
1,1,1-Trichloroethane	mg/kg dry					<DL	55							
Trichloroethene	mg/kg dry					48	16							
Toluene	mg/kg dry					170	87							0.037
Vinyl chloride	mg/kg dry					13	69							
GC/MS Acid Fraction		<DL	<DL	<DL	<DL			NA	<DL	<DL	NA	NA	NA	NA
Phenols	mg/kg dry					170	55							
Pentachlorophenol	mg/kg dry					740	290							
2,4-Dimethylphenol	mg/kg dry					83	<DL							
PCBs								<DL	<DL	<DL				
PCBs, Total	mg/kg dry	80.9	49.5	44.7	507	NA	NA				NA	NA	NA	NA
PCB-1016	mg/kg dry	NA	NA	NA	NA	NA	NA				9.4	24	0.25	0.41
PCB-1260	mg/kg dry	NA	NA	NA	NA	NA	NA				0.35	0.94	0.12	<DL
Pesticides	mg/kg dry	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	NA	NA	NA	NA
GC/MS Base/Neutral				NA				NA		NA	NA		NA	
Naphthalene	mg/kg dry	1300	280		2400	8700	1700		2.5			160		0.48
Acenaphthylene	mg/kg dry	240	62		340	2000	250		0.11			17		0.14
Acenaphthene	mg/kg dry	190	58		320	4100	170		0.83			27		0.19
N-Nitrosodimethylamine	mg/kg dry	160	39		700	<DL	150		<DL			<DL		0.29
Bis(2-ethylhexyl) phthalate	mg/kg dry	<DL	<DL		<DL	<DL	45		<DL			<DL		<DL
Di-N-Octyl-phthalate	mg/kg dry	16	13		<DL	<DL	<DL		0.61			<DL		<DL
Phenanthrene	mg/kg dry	710	150		1800	8300	630		1.8			91		0.51
Anthracene	mg/kg dry	120	38		200	2200	160		0.18			9.4		0.094
Fluoranthene	mg/kg dry	280	81		650	3000	170		0.35			21		0.48
Pyrene	mg/kg dry	280	84		540	2500	190		0.33			18		0.45
Chrysene	mg/kg dry	63	22		98	790	60		<DL			2.5		0.07
Benzo(A) anthracene	mg/kg dry	98	32		210	740	63		<DL			4.8		0.26
Benzo(B)fluoran	mg/kg dry	52	17		97	700	45		<DL			<DL		0.20
Benzo(A)pyrene	mg/kg dry	52	13		<DL	450	<DL		<DL			<DL		<DL
Ideno(1,2,3-CD)pyrene	mg/kg dry	<DL	<DL		<DL	110	<DL		<DL			<DL		<DL
Benzo(ghi)perylene	mg/kg dry	<DL	<DL		<DL	74	<DL		<DL			<DL		<DL
Fluorene	mg/kg dry	280	70		680	5400	400		<DL			59		0.25

NA = not analyzed.
<DL = less than detection limit (see Appendix J).
mg/kg = ppm.

Table 4-23. Head Space Analysis of SE25

Compound	Concentration (ug/m^3)	Concentration† (ppm)
* Chloroethane	11,000	4
Vinyl Chloride	140,000	55
* Methylene Chloride	4,000	1
* 1,1-Dichloroethene	12,000	3
1,1-Dichloroethane	55,000	14
Chloroform	190,000	39
Trans-1,2-Dichloroethene	96,000	24
1,2-Dichloroethane	110,000	27
* 1,1,1-Trichloroethane	4,000	0.7
* 1,2-Dichloropropane	2,000	0.4
Trichloroethene	41,000	8
Benzene	220,000	69
Tetrachloroethene	89,000	13
Toluene	78,000	21
Ethyl benzene	31,000	7

Methodology: 3.29 grams of Sample No. 299315 were transferred into a clean VOA bottle. 5 ml of head space from this bottle was injected onto the GC column.

Notes: * Compounds not detected in the solid sample analysis

† Concentration (ppm) = $\frac{(\text{ug/m}^3)\ (24,5000)}{(\text{molecular weight})(10^6)}$

(1016 and 1260) were found in samples SE11 through SE14 in concentrations ranging from a high of 24 ppm (SE12) to a low of 0.12 ppm (SE13).

The slough north of U.S. Highway 90 was sampled (See Table 4-24). Traces of phthalates and other base/neutral compounds seen in the main pit sediments/sludges were found in this slough at fractional ppm levels and below. TOE ranged from 574 ppm (SE08) to 2,660 ppm (SE15). No GC/MS volatile compounds were found. Traces of PCBs below 1 ppm were found in samples SE16, SE17, SE18 and SE19.

Sample SE20 north of the slough area showed anthracene (0.065 ppm), chrysene (.15 ppm) and traces of six other base/neutral extractable organic compounds found in the main pit. These two compounds were not found in the slough north of U.S. Highway 90, which might reflect contaminant transport processes which are active only during high water periods (i.e. flooding).

The pit east of the main pit (SE04) contained elevated TOE (541 ppm), but otherwise is practically free of organic contamination (see Table 4-24).

Organic analyses of other sediments collected from sites south and west of the main pit are presented in Table 4-25. Sample SE10 from the ditch immediately south of the main pit contained phenanthrene at 2.1 ppm and several other base/neutral compounds below 1 ppm that were also found in the main pit. Sediments from the abandoned sand pit south of Gulf Pump Road (S006 and SE22) were free of volatile compounds and otherwise contained low ppm levels of phthalates and three base/neutral compounds (naphthalene, fluoranthene, and pyrene). Sample SE23 from the drainageway toward Rickett Lake also contained low ppm levels of phthalates, 16 ppm methylene chloride, and 0.008 pppm of PCB-1260. SE24 further downstream exhibited higher levels of PCBs and TOX. Sediments from Rickett Lake (SE29--see Figure 4-19) contained 0.007 ppm PCB-1260, 2.8 ppm TOX, and low levels of phthalates.

The two ponds near the Riverdale Subdivision (SE27 and SE28) exhibited 2.5 and 7.3 ppm TOX, 341 and 1130 ppm TOE, and 0.46 and 0.021 ppm PCB-1260, respectively. Bis(2-ethylhexyl)phthalate was also found in both ponds.

Table 4-24. French Limited Sediments Chemical Analysis Results

Parameters	Units	SE08 April 1983	SE15	SE16	SE17	SE18	SE19	SE20	SE20D	SE21	SE04 April 1983
			SLOUGH NORTH OF U.S. 90					DRAINAGE NORTH OF 90			EAST PIT
			<—— November 1983 ——>					<— November 1983 —>			
Conventional Analysis											
Solids	% Wet	46.4	85.6	21.8	18.5	45.4	60.0	54.4	55.0	54.1	82.4
Carbon TOC	g/kg dry	11.2	0.35	30.4	36.4	18.5	8.85	14.2	20.9	13.3	1.35
TOX	mg/kg dry	49.6	1.6	5.4	17	2.5	1.9	2.0	1.6	0.75	7.1
TOE	mg/kg wet	574	2660	636	680	1330	921	568	314	410	541
GC/MS Volatiles		NA	<DL	<DL	NA	<DL	NA	NA	NA	NA	NA
GC/MS Acid Fraction		NA		NA	NA	<DL	NA	NA	NA	NA	<DL
Phenols	mg/kg dry		0.85								
PCBs		NA									
PCBs, Total	mg/kg dry		NA	NA	NA	NA	NA	NA	NA	NA	<DL
PCB-1016	mg/kg dry		<DL	<DL	0.39	0.062	<DL	<DL	<DL	<DL	NA
PCB-1260	mg/kg dry		<DL	0.027	0.042	0.012	0.011	0.016	0.021	0.024	NA
Pesticides			NA	NA	NA	NA	NA	NA	NA	NA	<DL
GC/MS Base/Neutral		NA			NA		NA			NA	
Naphthalene	mg/kg dry		0.022	<DL		<DL		<DL	<DL		<DL
Di-N-Octyl-phthalate	mg/kg dry		<DL	<DL		<DL		15	0.49		0.57
Di-N-butyl-phthalate	mg/kg dry		0.034	<DL		<DL		<DL	0.18		<DL
Bis(2-ethylhexyl)phthalate	mg/kg dry		0.81	0.83		<DL		17	0.44		<DL
Diethyl phthalate	mg/kg dry		<DL	<DL		<DL		0.059	<DL		<DL
Anthracene	mg/kg dry		<DL	<DL		<DL		<DL	0.065		<DL
Fluoranthene	mg/kg dry		<DL	<DL		0.088		<DL	0.025		<DL
Pyrene	mg/kg dry		<DL	<DL		0.1		<DL	0.029		<DL
Chrysene	mg/kg dry		<DL	<DL		<DL		<DL	0.15		<DL

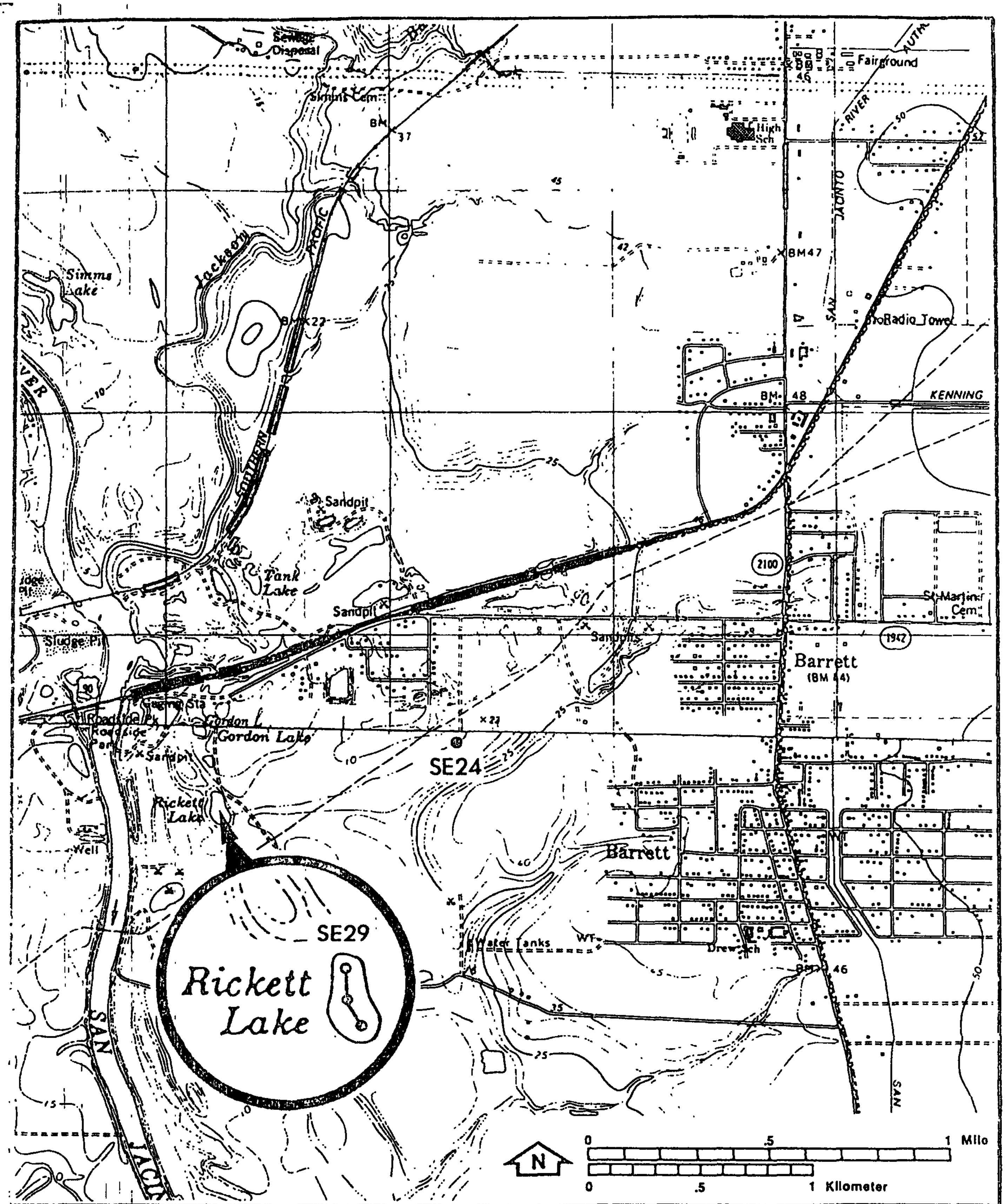
NA = not analyzed.
<DL = less than detection limit (see Appendix J).
mg/kg = ppm.

Table 4-25. French Limited Sediments Chemical Analysis Results

Parameters	Units	DITCHES NEAR SITE		LAKE SOUTH OF GULF PUMP ROAD			DRAINAGE TOWARD RICKETT LAKE		RICKETT LAKE	PONDS NEAR RIVERDALE	
		SE09	SE10	S006	S006D	SE22	SE23	SE24	SE29	SE27	SE28
Conventional Analysis											
Solids	% Wet	41.4	46.5	30.0	33.9	38.7	58.0	62.4	24.3	44.0	53.7
Carbon TOC	g/kg dry	16.2	14.2	19.2	18.1	13.0	4.74	4.70	21.4	11.8	8.24
TOX	mg/kg dry	21.5	0.53	82.7	85.4	0.91	0.84	0.77	2.8	2.5	7.3
TOE	mg/kg wet	2060	1380	646	647	<240	824	1310	594	341	1130
GC/MS Volatiles		NA	NA	NA	NA			NA	<DL	NA	NA
Benzene	mg/kg dry					0.045	<DL				
Methylene chloride	mg/kg dry					<DL	16				
GC/MS Acid Fraction		NA	<DL	NA	NA		NA	NA	NA	NA	NA
Phenols	mg/kg dry										
PCBs		NA		NA	NA	NA					
PCBs, Total	mg/kg dry		0.16				NA	NA	NA	NA	NA
PCB-1016	mg/kg dry		NA				<DL	0.3	<DL	<DL	0.12
PCB-1260	mg/kg dry		NA				0.008	0.022	0.007	0.46	0.021
Pesticides	mg/kg dry	NA	<DL	NA	NA	<DL	NA	NA	NA	NA	NA
GC/MS Base/Neutral		NA		NA	NA			NA			
Naphthalene	mg/kg dry		<DL			0.120	<DL		<DL	<DL	<DL
Acenaphthylene	mg/kg dry		0.73			<DL	<DL		<DL	<DL	<DL
Acenaphthene	mg/kg dry		0.42			<DL	<DL		<DL	<DL	<DL
Diethylphthalate	mg/kg dry		<DL			<DL	<DL		<DL	<DL	0.91
Di-N-butylphthalate	mg/kg dry		<DL			<DL	<DL		<DL	<DL	0.82
Bis(2-ethylhexyl)phathalate	mg/kg dry		<DL			23	2.6		0.78	0.32	9.5
Di-N-Octyl-phthalate	mg/kg dry		<DL			21	<DL		<DL	<DL	<DL
Phenanthrene	mg/kg dry		2.1			<DL	<DL		<DL	<DL	<DL
Anthracene	mg/kg dry		0.47			<DL	<DL		<DL	<DL	<DL
Fluoranthene	mg/kg dry		0.57			0.059	<DL		<DL	<DL	<DL
Pyrene	mg/kg dry		0.87			0.078	<DL		<DL	<DL	<DL
Chrysene	mg/kg dry		0.19			<DL	<DL		<DL	<DL	<DL
Fluorene	mg/kg dry		0.82			<DL	<DL		<DL	<DL	<DL
Nitrobenzene	mg/kg dry		0.23			<DL	<DL		<DL	<DL	<DL

NA = not analyzed.
<DL = less than detection limit (see Appendix J).
mg/kg = ppm.

BOOKMARK



Sewage Disposal
Fairground
Simms Cem
High Sch
BM47
Radio Tower
KENNING
Simms Lake
Jackson
Sandpit
Tank Lake
Sludge Pit
Sandpit
Sandpits
St Martin Cem
Barrett
(BM 44)
Roadside Pk
Roadside Park
Gordon L
Gordon Lake
Sandpit
SE24
Rickett Lake
Well
Barrett
Water Tanks
Drew Sch
SE29
Rickett Lake
SAN JACINTO RIVER
0
.5
1 Mile
0
.5
1 Kilometer
N

A sample of sediments from the main pit was tested for a variety of physical and chemical parameters which could affect the selection of treatment alternatives. These test results are listed in Table 4-26.

4.6.3 Sediments Assessment

The sludges and sediments in the main pit (SE01, SE02 and SE03) are substantially contaminated with naphthalene (up to 0.24 percent), phenanthrene (up to 0.18 percent), PCBs (up to 507 ppb), nitrobenzene (up to 680 ppm), and other organic compounds. Sampling by the USEPA on September 20, 1978 revealed PCBs (283 ppm) and oil and grease (10.8 percent) inside the main pit. EPA sampling in the north slough showed 1,560 ppm PCBs and 24.8 percent oil and grease. The solubility of many of these compounds is low, and consequently the surface and ground waters do not exhibit significant levels of these compounds. The volatile component of these sludges is also substantial, since benzene was found at 1100 ppm and over a dozen other compounds were seen in the high ppm range. The volatile compounds are affecting the shallow ground waters south of the main pit (see wells GW08 and GW09) at substantial (part per million) levels for some compounds. Seepage of leachate from the main pit to the shallow aquifer is occurring and appears to be transporting many of the volatile organics and some base/neutrals from the pit sludges into the shallow ground water.

The sub-bottom profiling and vibracore sampling (see Section 4.4.2) indicated sludge deposits up to 5.5 feet thick on the bottom of the central portion of the main pit. Samples SE03 and SE25/SE26 were taken closest to this zone, and showed generally the highest chemical contamination. The other samples were further from this sludge zone, and showed slightly lower concentrations. This concentration is likely to prevail across the entire underwater portion of the main pit. The vibracore samples indicate that dispersive forces (leaching, floods, etc.) over the past years have contaminated what was originally clean sands on the sides and floor of the pit. The <u>entire</u> bottom of the main pit is likely to be substantially contaminated to depths ranging from 1 foot up to a minimum of 6 feet beneath the sediment water interface.

Sludge/sediment deposits exhibiting substantial chemical contamination in the slough between U.S. Highway 90 and the main pit were found to depths of

Table 4-26. Physical Characterization of Sediment Composite French Limited Main Pit

Parameter	Value
pH	7.20
Alkalinity (% as $CaCO_3$)	5.76
Moisture (% Water)	83.68
Solids (% Solids)	16.32
Volatile Solids (% @ 550°C)	3.20
Oil and Grease (ppm)	6,385
BOD (%)	2.82
Carbon (% dry basis)	20.64
Hydrogen (% dry basis)	2.47
Nitrogen (% dry basis)	0.44
Sulfur (% dry basis)	2.26
Chlorine (% dry basis)	0.077
Sodium (% dry basis)	0.085
Potassium (% dry basis)	0.13
Phosphorus (% dry basis)	0.067
BTU/pound	3,334

12 inches in an earlier USEPA study (Nadeau, 1981). EPA's study found a distinct correlation between TOE and PCBs in sediments and cores taken from the slough area.

Sediments in the east pit (SE04) and north of the main pit (SE05, SE06, SE07, SE08, SE11, SE12, SE13, SE14, SE15, etc) exhibit definite contamination as indicated by TOX, TOC, and GC/MS base/neutral analysis, although at levels 1 to 2 orders of magnitude lower than the main pit. The Flood of 1979 created a breach in the north dike adjacent to the U.S. Highway 90 bridge, which allowed sludges and floating oily residues to escape into the backwater area beneath the bridge and between the highway and the main pit. Sediment SE20 indicates that some contaminant transport has apparently occurred into the area north of the highway, but that the contamination is not present in significant levels.

Sediments along the drainage pathway south of the site exhibit low level contamination (primarily phthalates and trace levels of PCBs) as far down as Rickett Lake. Transport of contaminants during flood events is probably the mechanism through which this occurs. Low level phthalate and PCB contamination (generally less than 1 ppm) on two ponds in the Riverdale area could also be explained by transport during flood events.

Because the major portion of the surface contamination other than the main waste pit sludges has cleaned up, the transport of contaminants by floodwaters or surface drainage is probably minimal. The contamination seen in and along the area drainageways is probably a result of past events and not an indicator of on-going surface migration of contaminants.

4.7 SOIL SAMPLES

4.7.1 Site Selection Sampling Methodology

Five soil samples (S001 through S005) were collected in April 1983, while five more soil samples (S007 through S011) were taken in November 1983 to supplement the previous sampling (see Table 4-27 and Figure 4-20). Soil samples were collected by compositing three to four subsamples from a given area. A hand trowel, shovel or post-hole digger was used to obtain the subsamples. The depth of the samples was 2 to 6 inches. Sampling tools were thoroughly cleaned and rinsed between each location. Cleaning involved removal of cross

Table 4-27. Soil Sample Sites, French Limited Site

Site Number	Rationale
April 1983 Sampling	
S001	Composite samples of soils from west end of French Limited site, near slough south of U.S. Highway 90.
S002	Composite samples of soils south of Gulf Pump Road in south swampy drainageway west of Old Harris County Landfill.
S003	Composite samples of soils along east site boundary.
S004	Sludge and soils above slough waterline south of U.S. Highway 90.
S005	Composite samples of soils north of U.S. Highway 90 in marshy area flooded by past high waters.
S006 ?	
November 1983 Sampling	
S007	Composite samples of soils above swamp waterline north of U.S. Highway 90 between slough and swampy drainageway.
S008	Composite sample of soils above swamp waterline south of Gulf Pump Road along south side of drainageway.
S009	Composite sample of soils in swampy drainageway south of Gulf Pump Road east of the Old Harris County Landfill, same locations as S002.
S010	Composite sample of soils taken from dry drainage ditch in northern portion of Riverdale Subdivision.
S011	Composite sample of soils taken in dry drainage ditch in south portion of Riverdale Subdivision.

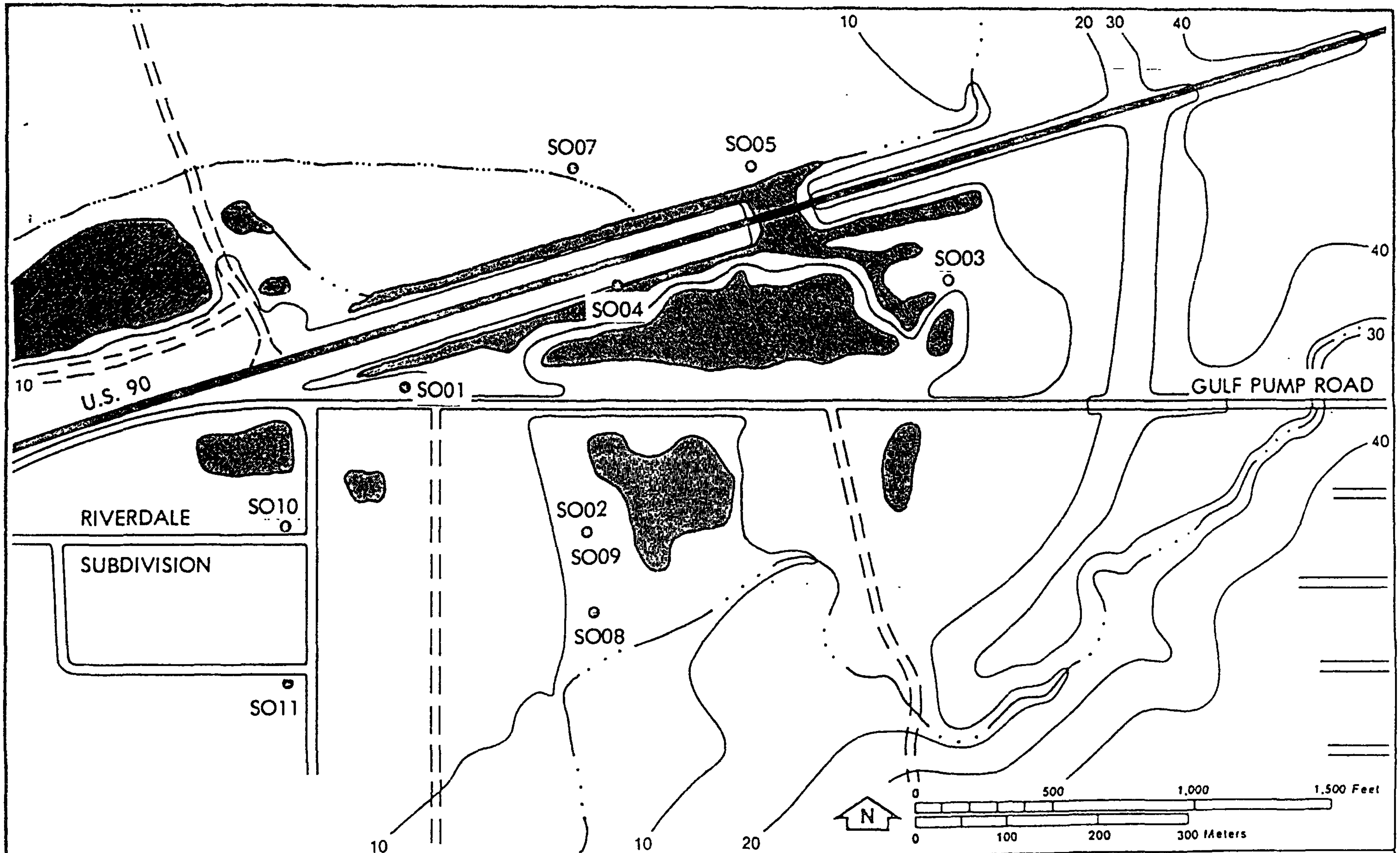


Figure 4-20
SOIL SAMPLING LOCATIONS

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contamination followed by a water rinse, followed in turn by a hexane then acetone rinse. The sample tool was then rinsed with distilled water and allowed to air dry. The first subsample was discarded as a further cleaning step.

4.7.2 Chemical Results

Chemical analyses are presented in Table 4-28. The sludge samples S001 and S004 in the backwater area around the slough south of U.S. Highway 90 exhibited the highest levels of TOE, TOX and TOC. A high level of contamination in S001 and S004 was expected, because the major portion of these samples was dried or semi-dried sludge residue. Contaminants in S001 were the most concentrated, with levels of TOE at 337,000 ppm (33.7 percent), TOX at 330 ppm, and TOC at 45 g/kg (4.5 percent). S001 and S004 contained PCBs at levels of 209 and 237 ppm, respectively. S001 and S004 also exhibited significant levels of GC/MS base/neutrals, some of which were naphthalene (480 ppm for S004), and phenanthrene (360 ppm for S004). S004 contained levels of acenaphthene, anthracene, chrysene and fluorene which were less than the detection limit in S001.

The soil sample S005, taken in April 1983 north of U.S. Highway 90, exhibited the lowest TOX (17.2 ppm) and the lowest TOE (421 ppm) of all the soil samples. S005 and S003 (taken east of the main pit) contained 0.10 ppm and 0.22 ppm di-N-octyl-phthalate, respectively. Sample S007, taken north of U.S. Highway 90 in November 1983, contained 0.014 ppm PCB-1260, 2.2 ppm bis(2-ethylhexyl) phthalate, and 5.6 ppm di-N-octyl-phthalate.

Sample S002 taken south of Gulf Pump Road in April 1983 was observed to have TOX of 140 ppm and TOE of 1,230 ppm, which was double that of sample S003. Sample S009 taken from the same vicinity in November had a TOX of 2.7 ppm and a TOE of 602 ppm. While sample S002 was not analyzed for GC/MS base/neutrals, S009 showed bis(2-ethylhexyl)phthalate (25 ppm) and di-N-octyl-phthalate (18 ppm) in the base/neutral fraction.

Sample S008 was collected further south of S009, and exhibited 0.15 ppm PCB-1260, 18.3 ppm TOC, 2.3 ppm TOX, and 1,630 ppm TOE.

Table 4-28. French Limited Soils Chemical Analysis Results

Parameters	Units	Incidence	Range	S001	S002	S003	S004	S005	S007	S008	S009	S010	S011
Date Collected				<--------------April 1983------------->					<-----------November 1983----------->				
Conventional Analysis													
Solids	% wet	5/5	30-78.2	78.2	45.1	46.7	55.6	47.1	67.4	48.4	48.7	87.9	83.3
Carbon TOC	g/kg dry	5/5	18.1-45.0	45.0	21.5	24.9	44.9	20.7	18.3	39.2	12.3	1.65	11.5
TOX	mg/kg dry	5/5	60-330	330	140	60	256	17.2	1.9	2.3	2.7	1.0	0.84
TOE	mg/kg wet	5/5	421-337000	337000	1230	646	313000	421	698	1630	602	<670	13100
Metals					NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	mg/kg dry	1/1	2.4	2.4									
Berylium	mg/kg dry	1/1	0.5	0.5									
Cadmium	mg/kg dry	1/1	0.5	0.5									
Chromium	mg/kg dry	1/1	220	220									
Copper	mg/kg dry	1/1	96.0	96.0									
Mercury	mg/kg dry	1/1	1.56	1.56									
Nickel	mg/kg dry	1/1	12.0	12.0									
Lead	mg/kg dry	1/1	136	136									
Selenium	mg/kg dry	1/1	0.7	0.7									
Silver	mg/kg dry	1/1	0.1	0.1									
Zinc	mg/kg dry	1/1	122	122									
PCBs, Pesticides					NA	NA		<DL					
PCBs, Total	mg/kg dry	2/3	209-237	209			237		NA	NA	NA	NA	NA
PCB-1016	mg/kg dry			NA			NA		<DL	<DL	NA	0.003	<DL
PCB-1260	mg/kg dry			NA			NA		0.014	0.150	NA	0.008	0.017
Pesticides	mg/kg dry			<DL			<DL	<DL	NA	NA	<DL	NA	NA
GC/MS Base/Neutral					NA					NA		NA	NA
Naphthalene	mg/kg dry	2/6	6.8-480	6.8		<DL	480	<DL	<DL		<DL		
Acenaphthylene	mg/kg dry	2/6	37-280	37		<DL	280	<DL	<DL		<DL		
Phenanthrene	mg/kg dry	2/6	19-360	19		<DL	360	<DL	<DL		<DL		
Fluoranthene	mg/kg dry	2/6	98-140	98		<DL	140	<DL	<DL		<DL		
Pyrene	mg/kg dry	2/6	110	110		<DL	110	<DL	<DL		<DL		
Benzo(A)anthracene	mg/kg dry	2/6	23-55	55		<DL	23	<DL	<DL		<DL		
3,4-Benzofluoran	mg/kg dry	2/6	25-32	32		<DL	25	<DL	<DL		<DL		
Acenaphthene	mg/kg dry	1/6	68	<DL		<DL	68	<DL	<DL		<DL		
Bis(2-ethylhexyl)phthalate	mg/kg dry	2/6		<DL		<DL	<DL	<DL	2.2		25		
Di-N-Octylphthalate	mg/kg dry	4/6	0.1-18	<DL		0.22	<DL	0.1	5.6		18		
Anthracene	mg/kg dry	1/6	16	<DL		<DL	16	<DL	<DL		<DL		
Chrysene	mg/kg dry	1/6	14	<DL		<DL	14	<DL	<DL		<DL		
Fluorene	mg/kg dry	1/6	140	<DL		<DL	140	<DL	<DL		<DL		
GC/MS Acids				<DL	NA	<DL	<DL	<DL	NA	NA	<DL	NA	NA
GC/MS Volatiles				NA	NA	NA	NA	NA	NA	NA	<DL	NA	NA

NA = not analyzed.
<DL = less than detection limit (see Appendix K).
mg/kg = ppm.

Samples S010 and S011, collected from the Riverdale subdivision, contained traces of PCB-1260 (0.008 ppm and 0.017 ppm, respectively). S010 also contained a trace of PCB-1016 (0.003 ppm). Sample S011 contained 11.5 ppm TOC and 13,100 ppm TOE, which may be due to waste oil from trucks or automobiles.

4.7.3 Assessment

Soil samples S001 and S004 exhibited the highest TOX levels of any of the area samples (330 and 256 ppm, respectively). These samples (primarily dried sludge) are from the zone of heavy sludge deposits reported earlier between U.S. Highway 90 and the main pit (Nadeau, 1981). These same two samples also exhibited the highest levels of GC/MS base/neutral compounds, as well as being the samples exhibiting the highest levels of PCBs (209 and 237 ppm, respectively). PCBs may not be uniformly distributed in the slough since the sediment samples (SE05, SE06 and SE07) SE12 + SE13 from the same area did not show any PCBs, however, if PCBs were primarily associated with floating sludges, they would be present only to a minor extent in the slough sediments. why

TOX levels in the November 1983 soil samples are much lower than levels found in April 1983. TOC and TOE were also somewhat lower in November but not significantly lower. Samples SE02 (taken in April) and SE09 (November) had TOX levels of 140 ppm and 2.7 ppm, respectively, and both samples were collected within 100 feet of each other from the swampy area south of Gulf Pump Road. No explanation for this difference can be found in the sampling technique or lab analytical method.

Recent flood events have transported sludge residues out of the French Limited main pit. Inspection of the area after the May 1983 flood revealed small sludge residues deposited on tree leaves and limbs south of Gulf Pump Road. The analysis of soil samples S007 through S011 indicates that soils away from the main pit do not appear to have been widely contaminated by past flood events.

Soil sample S002 was taken in April 1983 in the marshy area south of the main pit, some 400 feet along the flood pathway downstream from the main pit. The levels of TOX (140 ppm) and TOE (1,230 ppm) strongly suggest that past flood events (1969, 1973, and 1979) have indeed carried oily deposits southward across the site boundaries. No GC/MS analysis was run on this sample. Sample S009 was taken near S002 in November 1983, and analyzed for all GC/MS fractions. S009 was free of contamination except for bis(2-ethylhexyl) phthalate (25 ppm) and di-N-octylphthalate (18 ppm). S009 was not analyzed for PCBs, but S008 further south contained 0.15 ppm of PCB-1260. One isolated finding of PCBs at this level of contamination is not sufficient to demonstrate wide-spread pollution downstream.

Ezoull / own analyses

Soil sample S003 exhibited 60 ppm TOX, 646 ppm TOC, and 0.22 ppm di-N-octyl-phthalate. Since this sample, taken from the low lying area northeast of the main pit, did not show other organic contaminants found in the main pit sludges, this contamination may not be due to the French Limited site.

Soil sample S005, taken north of the U.S. Highway 90 bridge near the "fishing hole" beneath the bridge contained the lowest levels of TOX (17.2 ppm) and TOE (421 ppm) of any of the soil sites sampled. Di-N-octylphthalate was also seen at this site at 0.10 ppm. Contaminant transport northward from the main pit through U.S. Highway 90 bridge may have occurred. However, the absence of other contaminants in this sample raises doubt that this contamination originated from the French Limited site.

Soil sample S007 farther west from S005, indicates the same type of contamination as S005, primarily low ppm levels of two phthalates. S007 did, however, have a trace concentration of PCBs. This could have originated at either the French Limited or Sikes Disposal Pits site, existing evidence is insufficient for a conclusion.

The soils sampling and analysis suggests that significant levels of contaminants are not being transported off-site by flooding or other mechanisms. Contamination levels in the area soils indicate that some transport of contaminants may have occurred at some past time, but these transport mechanisms do not appear to be active now.

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4.8 FISH TISSUE

4.8.1 Sample Site Selection Rationale

Five composite samples of fish tissue were taken from the fishing hole (BIO1, BIO2, BIO3, FT04, FT05) beneath the U.S. Highway 90 bridge and analyzed to determine if metals and PCBs were accumulating in aquatic organisms. In addition, two samples were taken from the lake south of Gulf Pump Road (FT06, FT07), and two samples were taken from the lake in the Riverdale Subdivision (FT08, FT09) (see Table 4-29). Three samples were collected using electrofishing equipment in April 1983, and six more samples were taken in November 1983. The locations of these sites are shown in Figure 4-21. Individual fish tissue samples were composites of a minimum of two specimens of a single species.

4.8.2 Chemical Results

The fish samples BIO1, BIO2 and BIO3 collected in April 1983 all exhibited mercury concentrations ranging from 0.08 to 0.17 ppm (see Table 4-30). Mercury levels were below detection limit in all samples taken in November, 1983. The tissue samples also contained polychlorinated biphenyls (PCB) levels ranging from 2 to 390 ppb. These tissues would be those fish portions consumed by humans and thus would represent a direct component in the human diet. The Food and Drug Administration (FDA) currently has a limit of 5,000 ppb for PCBs and 500 ppb for mercury in fish tissues consumed by man. The FDA limit for PCBs will be reduced to 2,000 ppb in late 1984, but this change does not affect the conclusions in this report.

4.8.3 Assessment

The levels of PCBs and mercury in fish near the French Limited site clearly do not exceed the FDA criteria for human health protection. Since the levels of PCBs observed in the second set of field samples are all less than 390 ppb, PCBs in fish tissue do not appear to present a significant threat to human health at this time.

4.9 TERRESTRIAL ECOLOGY

The French Limited site consists of a fenced lagoon with steeply cut banks. North and northeast of the lagoon, separated by only 5 to 10 feet in some spots, are borrow pits which are filled with water. These borrow pits have been invaded by vegetation, and the vegetation in these sites could be compared with plants growing on and in the contaminated lagoon.

Table 4-29. Fish Tissue Samples Sites, French Limited Site

Site Number	Rationale
April 1983 Sampling	
BI01, 02, 03	Composites of fish specimens beneath U.S. Highway 90 bridge analyzed for bioaccumulation.
November 1983 Sampling	
BI04, 05	Additional fish specimens beneath U.S. Highway 90 bridge analyzed for bioaccumulation.
BI06, 07	Fish specimens in south pit analyzed for bioaccumulation.
BI08, 09	Fish specimens in pond on southwest corner of Gulf Pump Road and Maple Drive, analyzed for bioaccumulation.

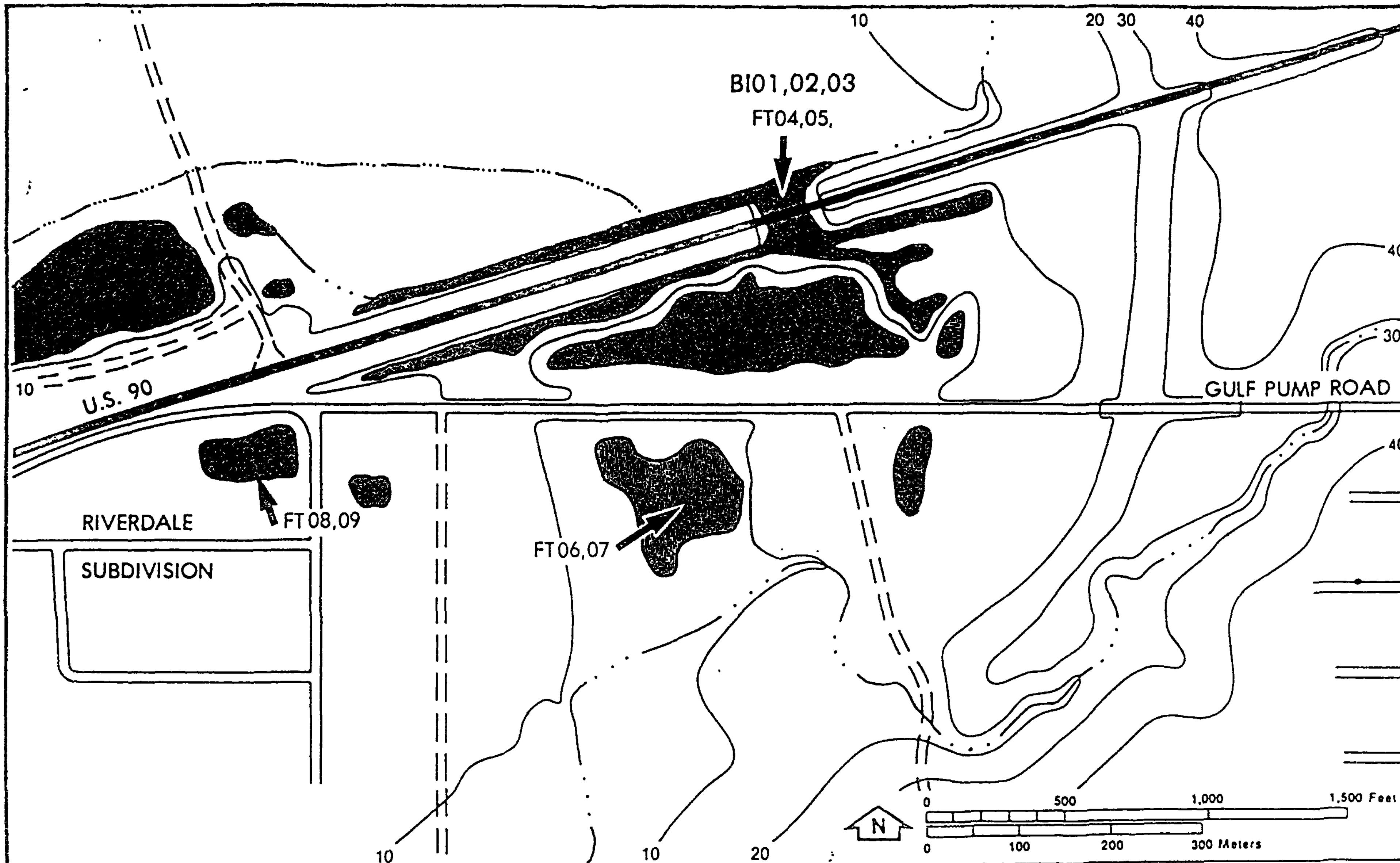

Figure 4-21
FISH SAMPLING LOCATIONS

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Table 4-30. French Limited Fish Tissue

Compound	Units	FDA Criteria	Range	B101	B102	B103	FT04	FT05	FT06	FT07	FT08	FT09
Date Collected				<-April 14, 1983-->			<------------November 27, 1983------------>					
Location				<--"Fishing Hole" beneath U.S. 90-->					<-Lake South->		<-Lake in Riverdale->	
Fish Type				<--Mixed Species--> (Carp, Gizzard Shad, Bass)			Bowfin	Blue-gill	Bowfin	Long-ear	Large-mouth bass	Blue-gill
PCBs	ug/kg wet	5000	18-390	18	194	41	22	106	68	392	180	102
Copper	ug/kg wet	--	110-1900	930	1900	920	280	150	580	150	170	110
Mercury	ug/kg wet	500	80-170	170	80	90	<220	<210	<210	<250	<230	<220
Zinc	ug/kg wet	--	3560-12100	6030	4940	12100	3560	6700	6020	4850	5350	6710

ug/kg = ppb.

Willow, red maple, green ash, and emergent herbaceous plants exist on the edge of the borrow pits. Duckweed and algae cover the surface of the water, and frogs and turtles are abundant. Turtles and snakes were observed in the main pit and along its banks. The dominant plant on the banks was sesban, a leguminous shrub common to disturbed wet areas of Harris County. The plants on the banks showed a high incidence of dead branches, although sesban growing in nearby disturbed areas away from the lagoon were healthy and fully leafed out. In some areas of the lagoon, cattails and sedges grew in the shallow water, however, leaf death on these plants was high and they were in poor health.

If the water were to remain within the banks of the lagoon its impact on the terrestrial system would not be significant because the area of habitat loss is small. However, there is potential for flood waters to overflow the site into the nearby borrow pits and across the adjacent lands, which are used extensively by wildlife. River flooding can also carry contaminants from the lagoon to other areas where they may be toxic to wildlife and humans who consume the wildlife.

4.10 SAFETY

A site safety plan was developed to provide for protection of personnel and the neighboring environment. The Site Safety Officer was charged with implementation of the Safety Plan.

4.10.1 Well Drilling Operations

Soil boring and well drilling was an important phase in the site investigation. The work had inherent risks associated with the possibility of encountering high concentrations of gases or vapors. Drilling personnel participated in extensive physical examination prior to initiating work and wore protective clothing consisting of disposable coveralls, neoprene boots, reinforced cotton gloves with liquid-proof inserts, and hard hats. The safety officer was present at all borings and drillings to monitor the breathing zones of the drill creews. All breathing zone measurements were made with a HNU, Inc. Model 101 photoionization detector (PID) and were below 1 ppm. Half-face organic vapor respirators were available but conditions did not warrant their use. There were no exposure-related or physical injury problems throughout the duration of both drilling programs.

4.10.2 Bathymetry, Sub-Bottom Profiling, and Open Water Sample Collection

Small boats were used to collect samples from the main pit and other bodies of water at the site. Initial investigation of ambient organic concentrations in the air on the lagoon indicated a concentration of about 1 ppm. It was decided that all boat work on the lagoon would require organic vapor respirators. Workers also wore disposable coveralls, neoprene boots, impervious gloves, and participated in physical examinations. The investigative work on the main waste pit was completed without incident.

4.10.3 Well Development and Sampling

This part of the site investigation was again accomplished by workers who had undergone physical exams. Protection of the workers from contact with the development water was paramount, and the use of coveralls, boots, and gloves was again employed. Constant air monitoring was necessary during well sampling to insure contaminant-free breathing. A few wells required the use of organic vapor respirators when ambient levels approached 1 ppm. All work was completed in a safe manner with no incidents. Environmental sampling in areas remote to the main lagoon (outside the "hot zone") was accomplished in normal work clothes with the use of impervious gloves.

4.10.4 Summary

Air monitoring during all work activities rarely produced readings in excess of 0.5 ppm. Steady concentrations of 1 ppm or more were used to trigger respirator use. Personal protective equipment chosen was judged to be adequate; available higher level protection was available but proved unnecessary. All medical problems were of minor significance and ranged from small cuts to minor heat stress. These conditions were easily handled on site by the Safety Officer and Field Team Leader. The public did not intervene in such a manner as to cause safety problems, and individuals encountered merely wanted to satisfy their curiosity about the site work. Emergency measures such as evacuation, police calls, or hospital calls were not necessary throughout the project duration. Decontamination procedures utilized water and detergent or degreaser to remove visible soiling, providing confidence that contamination was not carried offsite.

5.0 SITE ASSESSMENT

5.1 MIGRATION PATTERNS

5.1.1 Contamination Characteristics

Sludges in the main pit at the French Limited site contain substantial levels of volatile halogenated organics, volatile aromatic organics, polynuclear aromatic hydrocarbons, naphthalenes, phthalates, polychlorinated biphenyls, and phenolics. A summary of the peak concentrations of these compounds is shown in Table 5-1. The high levels of some of these compounds have undoubtedly masked other similar compounds from detection during this survey. Nevertheless, the compounds in Table 5-1 provide a strong indication as to the waste composition at the French Limited site. Samples from the environment around the site can be used to trace the movement of these compounds through surface water, ground water and other pathways.

5.1.2 Surface Migration

The sludges and liquids dumped into the French Limited main pit between 1966 and 1972 have served as the chief source of environmental contamination in the site vicinity. The suspended solids in the liquids undoubtedly settled to the bottom of the pit, and the lime that French Limited added to the pit in the early 1970s to neutralize the liquids changed the surface water chemistry. The San Jacinto River floods of 1969 and 1973 exerted significant environmental forces upon the liquids and sludges in the main pit. The floodwaters diluted the liquids in the main pit and flushed substantial portions of the waterborne contaminants out of the pit. Traces of these contaminants would be found today in the downstream direction from the pit (see Figure 5-1). Sediments (at SE24 and SE29) downstream along this flood pathway show traces of PCB-1260 and elevated levels of TOE. The Rickett Lake sediment (SE29) farthest downstream showed lower concentrations than the sites closer to the main pit. Based upon observations during the flood of May 1983, the passage of these floodwaters did not appear to significantly disturb or erode the sludges in the bottom of the main pit.

The flood of April 1979 played a key role in dispersing sludges out of the main pit. This flood breached the north berm of the pit near the U.S. Highway 90

Table 5-1. Peak Concentrations in Main Pit Sludges
French Limited Site

Volatile Halogenated Organics		**Polynuclear Aromatic Hydrocarbons**	
Chloroform	230 ppm	Phenanthrene	8300 ppm
1,1-Dichloroethane	150 ppm	Anthracene	2200 ppm
1,2-Dichloroethane	230 ppm	Fluoranthene	3000 ppm
T-1,2-Dichloroethene	200 ppm	Pyrene	2500 ppm
Methylene chloride	170 ppm	Fluorene	5400 ppm
Tetrachloroethene	120 ppm	Chrysene	790 ppm
1,1,1-Trichloroethane	55 ppm	Benzo(A)anthracene	740 ppm
Trichloroethene	48 ppm	Benzo(B)fluoran	700 ppm
Vinyl chloride	69 ppm	Benzo(A)pyrene	450 ppm
		Ideno(1,2,3-CD)pyrene	110 ppm
Volatile Aromatic Organics		Benzo(ghi)perylene	74 ppm
		Acenaphthylene	2000 ppm
Benzene	270 ppm		
Ethylbenzene	87 ppm	**Naphthalenes**	
Toluene	170 ppm		
		Naphthalene	8700 ppm
Polychlorinated Biphenyls		Acenaphthene	4100 ppm
Total PCBs	507 ppm	**Phthalates**	
Phenolics		Bis(2-ethylhexyl)phthalate	45 ppm
		Di-N-octyl-phthalate	16 ppm
Phenol	170 ppm		
Pentachlorophenol	740 ppm		
2,4-Dimethylphenol	83 ppm		

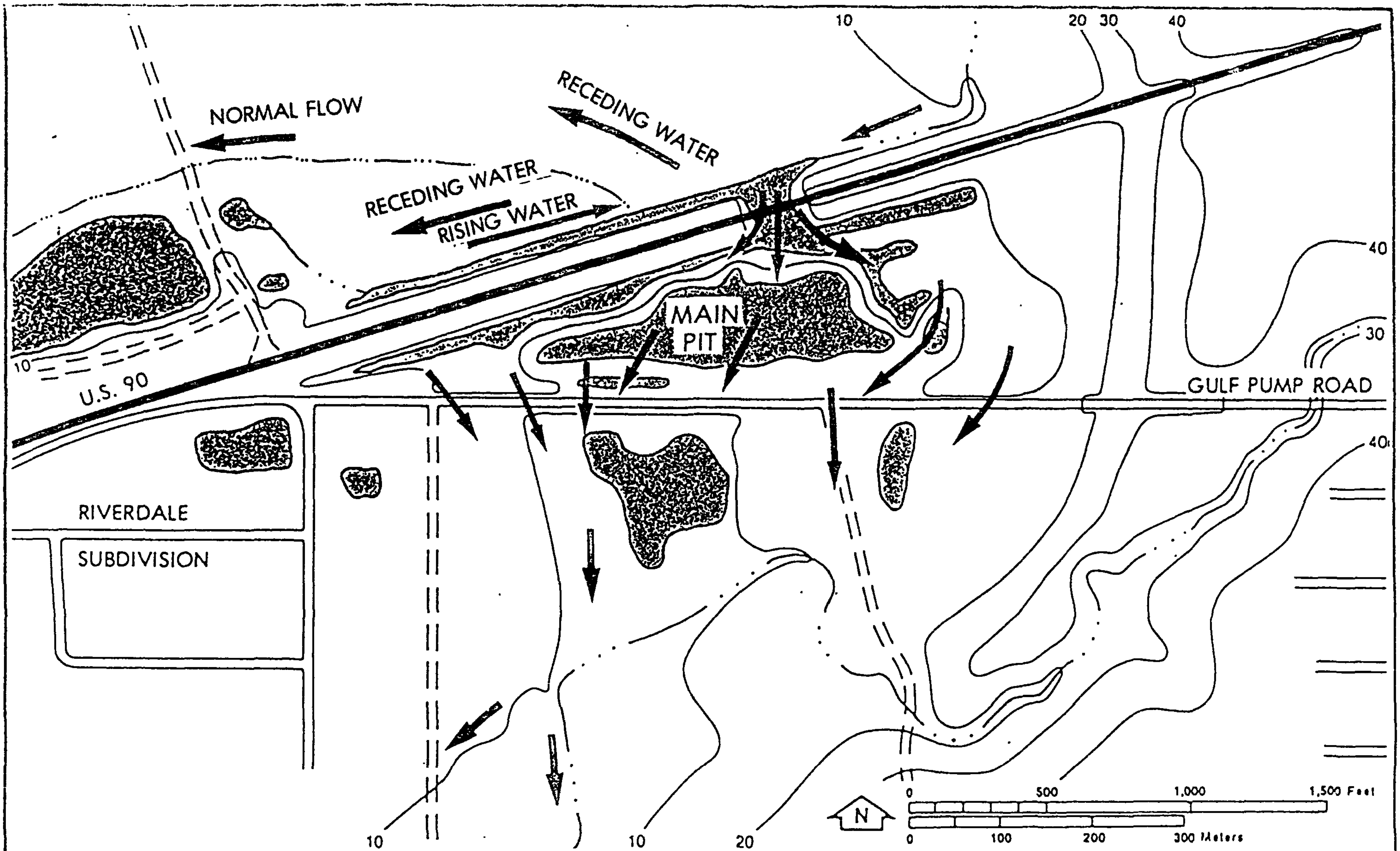

Figure 5-1
FLOOD FLOW PATTERNS
MAY 23-24, 1983

FRENCH LIMITED SITE

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bridge which allowed sludges to move into the slough between the main pit and the highway. While EPA has since removed the floating sludges from the slough, intermittant patches of dried or partially dried sludges are evident along the banks of the slough, and the sediments in the slough still exhibit significant contamination. This contamination has also passed northward beneath the U.S. Highway 90 bridge and is now found in the slough along the north side of the road. Low levels of PCBs, naphthalene, phthalates, and polynuclear aromatics are found in the slough north of the highway. However, this contamination north of the highway is not present at significant levels, and does not pose a health hazard to the area populace.

Similarly, trace levels of PCBs, polynuclear aromatics, and phthalates are found in the soils, and sediments south of the site (south of Gulf Pump Road). However, the contamination was not found at levels which might pose a health hazard to the area populace.

5.1.3 Contaminate Groundwater Migration

The existing hydraulic gradients, the calculated permeabilities in the alluvium and the result of the groundwater chemical analysis were used to determine the extent of the contaminate plume originating from the French Limited pit. The specific data used in calculating the extent of the plume is as follows:

1. Time span of 18 years (1966 to 1984);
2. Groundwater and lake elevations on December 7, 1983; and
3. A horizontal permeability of $3x10^{-2}$ cm/sec in the Upper Aquifer (Alluvium).

Figure 5-2 shows that the extent of the plume to the north, east and west is likely to be less than 200 feet; however, to the south the front of the plume is estimated to be approximately 700 feet from the pit and advancing about 15 feet per year. The projected path direction of the plume is also shown on Figure 5-2. As the plume extends toward the south, it will be confined to the alluvium by the Pleistocene deposits (clays) comprising the east valley wall and it will be compressed into a narrower band by the higher groundwater gradients in the Riverdale Subdivision. In approximately 100 years the front of the plume will have advanced to the southern section of the old Harris

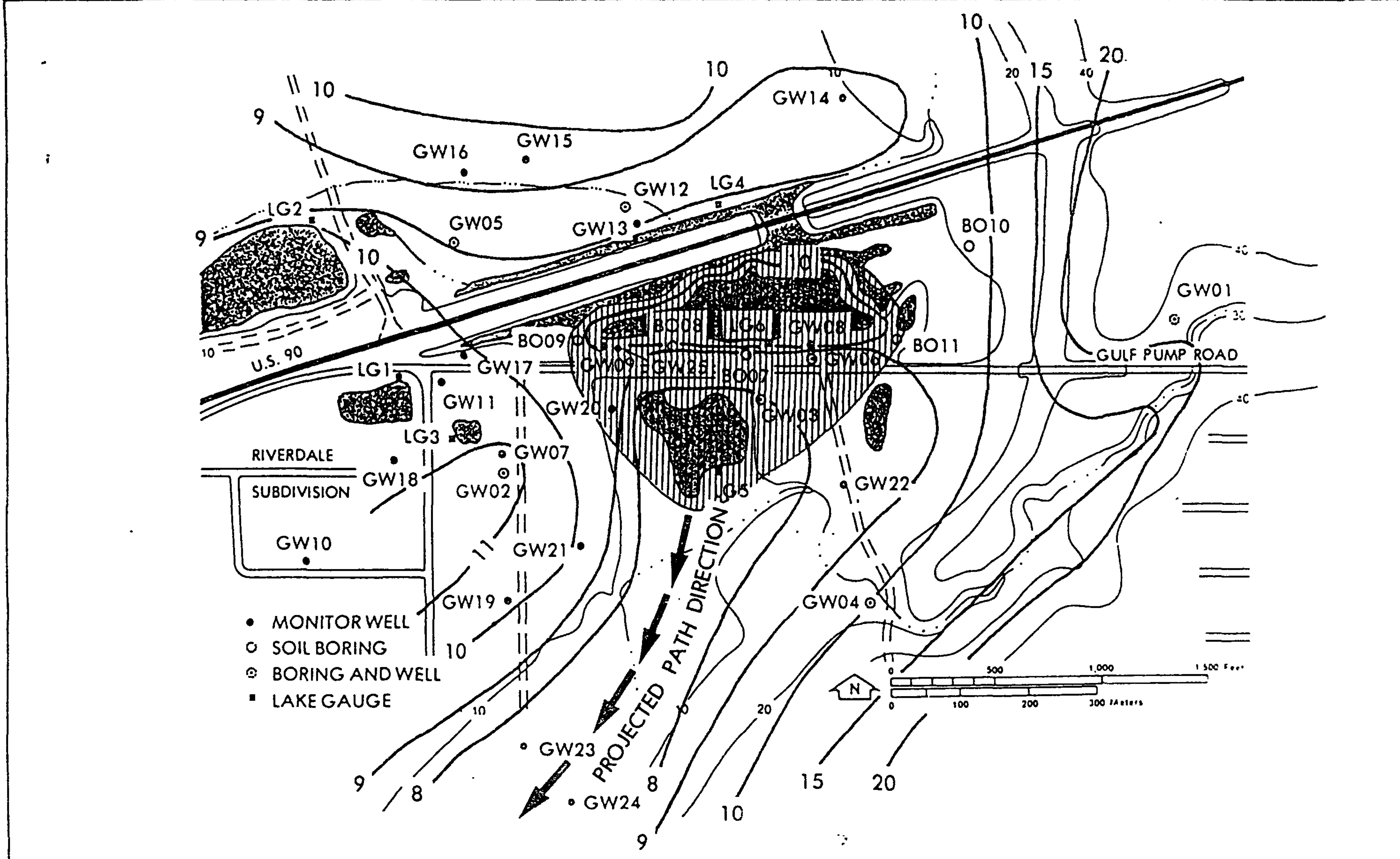

Figure 5-2

CONTAMINATED GROUND WATER MIGRATION FROM MAIN WASTE PIT

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County landfill and the marsh directly to the south. Beyond this area, there are no monitoring wells so the flow direction is not known; however, it is likely to be toward the river.

Vertical migration from the Upper to the Lower Aquifer is estimated to be approximately 0.1 feet/year. At this rate, the contaminate plume in the alluvium has penetrated the underlying Beaumont clay only a few feet and would take approximately 900 years to migrate through 90 feet of clay to the lower aquifer.

5.2 WASTE VOLUME ESTIMATES

The sludges in the main pit appear to be the principal source of contamination affecting the environment around the French Limited site. The sludges that have been dumped in the main pit have covered the deepest portions of the pit and have become mixed with the native sands, either through seepage or physical slumping of the sides of the pit. The available data suggest that there is approximately 200,000 to 300,000 cubic feet of sludges and from 500,000 to 1,000,000 cubic feet of contaminated sands in the main pit. The bathymetric study indicates that the main pit contains approximately 24.5 million gallons of water. See Table 5-2 and Section 4.4 for details.

The estimates of sludges reflect the observations in April 1983, and do not account for the total amount of sludges originally dumped into the pit (approximately 2.5 million cubic feet). Much of the waste was burned as part of the French Limited operation, also some of the floating wastes were removed and disposed of during emergency and planned removals. The San Jacinto River floods of 1969, 1973, and 1979 exerted significant environmental forces upon the sludges, and transported unknown quantities out of the pit. Some portion of the sludges was deposited nearby outside the main pit, while the remainder were carried downstream with the floodwaters.

The largest deposits of sludges outside the main pit are in the slough south of U.S. Highway 90, which contains an estimated 140,000 cubic feet of sludges and heavily contaminated sediments and soils (see Table 5-2).

Table 5-2. Waste Volumes at the French Limited Site

Medium	Estimated Area (acres)	Estimated Depth* (feet)	Estimated Volume
I. Sludges/Sediments/Soils			(ft³)
Sludges in Main Pit	7.3	0.7	200,000-300,000
Contaminated Sands in Main Pit	7.3	1.6	500,000-1,000,000
Swamp between Pit and U.S. 90	4.6	0.7	140,000
II. Surface Waters			(gallons)
Main Pit	7.3	10.6	24,500,000
Swamp between Pit and U.S. 90	4.6	2	3,200,000

* Average depth over entire area.

5.3 TARGET RECEPTORS

The French Limited hazardous waste site may pose potential risks to the following types of target receptors:

- Sensitive ecosystems,
- Natural resources, and
- Population at risk.

5.3.1 Sensitive Ecosystems

As presented in the discussion on Environmental Setting and Terrestrial Ecology, Sections 1.3 and 4.8, respectively, the vegetation, land animals, fowl and fish life in and around the French Limited site are common to the area. No sensitive habitats or protected or endangered species were observed during the site survey or are known to exist in this area.

Potential impacts on the area's ecosystem may occur via terrestrial plant uptake and plant ingestion, via surface water contamination, groundwater contamination and airborne contaminants. As noted in Section 4.8, some effects on vegetation were observed surrounding the lagoon. However, all other areas on-site and off-site appeared to sustain a healthy vegetative cover. These observations indicate that effects on the vegetative community are limited only to direct contact with the contaminants in the main waste pit and where surface water movement due to flooding has transported the contaminants along area drainageways and floodplains.

Surface mechanisms such as deposition of airborne contaminants or contact with any airborne vapors have had little if any impact on the health of the plant communities in the area. The presence of several types of animal tracks and observation of small fish in the shallow channel connecting the two parts of the main disposal pit tend to indicate limited direct impact on the immediate terrestrial and aquatic systems. However, since PCBs were found in fish tissue collected from various pits and lakes, at levels as high as 392 ppb, the French Limited site is potentially impacting the aquatic community.

Because of the observations made during the ecological "walk-over" survey of the site, the common nature of the flora and fauna in the area, and the primary objectives of the work program, limited data were collected relative to fully defining the extent of the impacts on the area's ecosystem. Primary emphasis was placed on definition of the nature, extent, and direction of the contamination at the French Limited site.

5.3.2 Natural Resources

Site reconnaissance defined the natural resources of concern to consist mostly of forested areas, surface water channels, groundwater aquifers, and mineable sand.

While land use in Harris County is divided into cropland, pasture and range (40 percent), forested (15 percent), and the remainder urban, the immediate French Limited site and vicinity consists of forested, industrial, and residential areas.

The French Limited site is located within the 100-year flood plain of the San Jacinto River. Since the site started operations in 1966, four floods have occurred (1969, 1973, 1979, and 1983). These floods represent intense, short-duration events which inundate the site and exert significant natural forces to disperse surface contamination beyond the site boundaries. The floodwaters in 1979 successfully eroded the north berm of the main pit and created a pathway for sludge and sediment outflow into the adjacent swamp.

Surface waters in the vicinity of the French Limited site are used for recreational activities, primarily fishing. PCBs were found between 18 and 194 ppb in fish fillets taken from the local "fishing hole" beneath the U.S. Highway 90 bridge immediately north of the main pit and up to 392 ppb in fish from lakes south of Gulf Pump Road. Since fish from the "fishing hole" north of the main pit do not exhibit PCBs higher than from the lakes south of Gulf Pump Road, a clear link between PCB in these fish and sludges from the pit cannot be established.

Contamination of the soils in the site area could pose a hazard to human health if agricultural development of these areas were to take place in the future. Uptake of contaminants by vegetation destined for consumption by cattle or humans could result. The commercial development of land areas potentially affected by the site appears to be highly unlikely. A large portion of the area around the site lies within the 100-year floodplain of the San Jacinto River and Harris County, and the federal government restricts building and development in flood prone areas. In addition to being in the floodplain the area is relatively far removed from the metropolitan Houston area and not readily accessible to large work centers. Improvements necessary to remedy the situation do not appear feasible at this time; however, construction of the new U.S. Highway 90 may change the development outlook and thus area land use.

There are approximately 34 residences in the Riverdale Subdivision and another seven residences along Magnolia Drive (west of Riverdale) that are within 4,000 feet of the French Limited main pit. Of these residences, 14 are known to draw water supplies from wells less than 100 feet deep (see Appendix M). These residences are listed in Table 5-3. The closest wells to the main pit are along Maple Drive (within 1,000 feet of the main pit). The source of domestic water for the other 27 houses is either deep wells (greater than 100 feet deep), unidentified shallow wells or hauled-in water. These residences are at slightly higher elevations (about 20 feet above mean sea level) than the main pit, and the water table in this area in the direction of the subdivision is slightly higher than the site vicinity. Nevertheless, ground water beneath the French Limited site appears to be moving southward (east of Riverdale) and westward (north of Riverdale). Thus, if the shallow groundwater gradients temporarily disappear or shift, these residences could be subjected to shallow groundwater contamination, either from the east or from the north. Assuming all residences are occupied, and occupancy averages three people per household, then as many as 123 people could be exposed to groundwater contamination from the French Limited site.

The high concentrations of groundwater contamination were found in shallow wells along the south side of the French Limited main pit. If the sludges in the main pit causing this contamination are left in an uncontrolled state for long periods of time (i.e. decades), shallow ground waters further removed from the French Limited site will become contaminated at levels exceeding the current human health criteria. The nature and thickness of the clay layer

Table 5-3. Shallow Residential Wells at French Limited Site Vicinity*

Residence Address		Casing Size (inches)	Well Depth (feet)	Comments
[redacted] --	[redacted]	2	65-100	
(Riverdale)		--	40-60	
		--	--	
		2	58	
		2	52	GW11
		2.5	62	
		2.5	65	
		2	100	New well replaces older well
[redacted] --	[redacted]	2.5	220	
(Riverdale)		2	60	
		2	85 or 185	
		2	90	
		2	87-100	GW10
		2	90	
		2	--	
[redacted] --	[redacted]	2	240	
(Riverdale)	--	2	240	
	[redacted]	4	--	
		2 (2)	50-75 (2)	
		2	25	
[redacted] --	[redacted]	--	24	
(Riverdale)				
[redacted] --	[redacted]	4	237	
		4	240	
	--	3	180-200	
	[redacted]	2	180-200	
[redacted] --	[redacted]	4	300	
		4	300	
		4	300	
		3	180-200	
		4	240	

* Other shallow wells which have not been reported may exist in the area.

underlying the site makes contamination of the lower aquifers highly unlikely. If, however, contamination was introduced (by faulting, drilling, etc.) into the lower aquifer a significant number of people potentially could be affected. Five major drinking water wells screened as shallow as 200 feet are located within 2 miles downgradient of the French Limited site. These wells supply the town of Barrett, the City of Crosby, and other nearby communities.

No contamination criteria exist for soils and sediments. However, the high levels of sediment contamination observed in the main pit and in the slough between the main pit and U.S. Highway 90 are exposed to large natural dispersion forces (chiefly floods). Significant health risks would be created if these sludges and sediments were dispersed in an uncontrolled fashion. Soils and sediments farther removed from the French Limited site, but still in the immediate vicinity, appear not to be significantly affected by past flood events. The primary risk involved off-site is contact with undiluted heavily contaminated sludges or sediments transported intact from the site area. Previous removal actions at the site have removed the bulk of surface contamination making this highly unlikely, while off-site accumulation of sludges is minimal to non-existent.

5.3.3 Population at Risk

The French Limited site is approximately two miles southwest of Crosby, Texas and one mile west of Barrett, Texas. The combined population of the Crosby/Barrett area is approximately 5,250 based on the 1980 census. Southwest of the site is the Riverdale Subdivision with a residential population of less than one hundred people. Other homes are located along Gulf Pump Road south of the site and U.S. Highway 90.

The Crosby/Barrett area is primarily residential with some commercial businesses and some sand mining operations along the San Jacinto River and its tributaries. Some farming also occurs in the outlying areas. Approximately one-half mile west of the site, on the western bank of the San Jacinto River, St. Regis Paper Company operates a pulp/paper mill.

The French Limited site is surrounded by densely wooded lands and intermittent swampy areas. The area contains numerous abandoned sand pits which are frequented by area sport fishermen.

The population potentially at risk includes:

- residents in the nearby Riverdale Subdivision;
- residents along Magnolia drive;
- employees of the nearby sand mining operations
- sport fishermen that frequent the San Jacinto River, and some of the abandoned sand pits;
- travelers along U.S. Highway 90 and Gulf Pump Road; and
- Harris County, Precinct 2 maintenance personnel.

In examining the population at risk, it is important to consider the mechanisms or pathways by which these people may become exposed to the contamination. The primary pathways of potential concern for the French Limited site area are:

1. consumption of contaminated ground water,
2. ingestion of contaminated aquatic species and plants,
3. direct contact with contaminated soils and surface water, and
4. inhalation of airborne contaminated dust.

Although all four of the pathways defined above have the potential for producing acute short-term effects, the first pathway (consumption of contaminated ground water) is most likely to produce serious long-term effects.

Based on the above discussion and the potential population at risk, the residents in the Riverdale subdivision and those along Magnolia Drive are most likely to suffer long-term chronic effects as well as any acute effects.

Because of the popularity of sport fishing in and around the French Limited site, and the potential for this segment of the population to be subjected to the contamination from the French Limited site by all of the last three pathways defined above, the sport fishermen are considered to be the second most likely segment of population at risk to suffer both acute and chronic effects. However, because of the surface water removal mechanisms observed at the site, that is, the persistent flooding of the disposal area and the movement and dispersion of contaminants, the effects resulting from the last three pathways of exposure will continue to diminish. On the other hand, the potential for well water contamination will continue to increase as the contaminant plume moves outward from the immediate site area. This movement will occur as long as a sufficient concentration of the contaminant mass remains within the French Limited site. Once the source mass is removed the potential for exposure to contamination from the well water will diminish accordingly.

5.4 SIGNIFICANCE OF WASTE CONCENTRATIONS

The waste chemicals at the French Limited site are present in the sludges and sediments in the bottom of the main pit and in the soils and sediments of many of the adjacent pits and ditches. Surface waters in the main pit contain low ppb levels of the more soluble chemicals (chiefly volatile organics), while the ground waters immediately south of the main pit contain significant (high ppb) levels of these same volatile organics.

Mercury was the only inorganic chemical (observed at 0.7 ppb in ground water with a criterion of 0.144 ppb) observed in water above its 10^{-5} incremental cancer risk human health criterion (see Appendix F), and it appeared only in the background well. No groundwater wells on the site proper exhibited mercury contamination. Additionally, this level of mercury is below the 2 ppb primary drinking water standard.

A comparison of the highest observed concentrations in water at French Limited with the 10^{-5} risk level human health criterion is shown in Table 5-4. Both ground water and surface water concentrations are shown in the table. The 10^{-5} human health criteria were used for comparison due to the lack of drinking water standards governing most of the organic compounds found in the ground water. One compound, tetrachloroethene, was found in ground water at more than 100 times its 10^{-5} human health criterion level. Four compounds were seen in ground water at between 10 and 100 times their 10^{-5} human health criteria: benzene, carbon tetrachloride, 1,2-dichloroethane, and

Table 5-4. Summary of Maximum Concentrations at French Limited and Human Health Criteria (All Units in ug/l or ppb)

Parameter	Human Health Criterion*	Highest Observed Levels: Ground Water	Highest Observed Levels: Surface Water
benzene	6.6	180†	1500†
carbon tetrachloride	4.0	44†	-
chlorobenzene	488	7	-
chloroform	1.9	-	390†
1,2-dichloroethane	9.4	440†	190†
1,1-dichloroethene	0.33	-	13†
1,2-dichloropropane	87	-	17†
ethylbenzene	1,400	68	500
methylene chloride	1.9	74†	-
tetrachloroethene	8.0	910†	63
trichloroethene	27	44†	110
toluene	14,300	67	410
vinyl chloride	20	39†	180†
acenaphthene	20	-	260
anthracene	0.028	-	220
benzo(A)anthracene	0.028	-	280
chrysene	0.028	-	170
fluoranthene	42	-	630
fluorene	0.028	-	570
phenanthrene	0.028	-	1300
pyrene	0.028	-	740
phenol	3,500	32	-
bis(2-ethylhexyl) phthalate	15,000	13	390
lindane	0.186	-	0.045
mercury	0.144	0.7†	-

* Values correspond to the proposed 10^{-5} incremental cancer risk levels for human health protection as discussed in Appendix F.

† Exceeds the 10^{-5} human health criterion.

methylene chloride. Three compounds in ground water (trichloroethane, vinyl chloride, and mercury) and one compound in surface water (chloroform) were observed at between 1 and 10 times their 10^{-5} human health criteria. Several compounds attributed to the French Limited site were found below the criteria levels in both ground water and surface water.

A summary of the observed metals contamination and the Primary Drinking Water Standards (see Appendix F) is presented in Table 5-5. No metals were observed above the drinking water standards.

The high concentrations of groundwater contamination were found in shallow wells along the south side of the French Limited main pit. If the sludges in the main pit causing this contamination are left in an uncontrolled state for long periods of time (i.e. decades), shallow ground waters further removed from the French Limited site will become contaminated at levels exceeding the current human health criteria.

No contamination criteria exist for soils and sediments. However, the high levels of sediment contamination observed in the main pit and in the slough between the main pit and U.S. Highway 90 are exposed to large natural dispersion forces (chiefly floods). Significant health risks would be created if these sludges and sediments were disturbed in an uncontrolled fashion.

Table 5-5. Drinking Water Standards for Metals
(All Units in ug/l or ppb)

		Highest Observed Levels	
Parameter	Drinking Water Standard	Ground Water	Surface Water
Chromium	50	26	11
Copper	1,000	7.6	6.6
Mercury	2	0.7	0.3
Lead	50	5.9	--
Zinc	5,000	49.5	17.9

6.0 REFERENCES

Bouwer, H. and Rice, R.C. 1976. A Slug Test for Determining Hydraulic Conductivity of Unconfined Aquifers with Completely or Partially Penetrating Wells. Water Resources Research, 12(3):423-428. Washington, D.C.

Food and Drug Administration. 1974. Poisonous or deleterious substances in peanuts, evaporated milk, fish, and shellfish. Proposed rules. Federal Register December 6, 1974. Washington, D.C.

Lockwood, Andrews, Newnam, Inc. 1983. French Limited Work Plan--Volume I, Project Activity and Sampling Plan. February 1983. Houston, Texas.

Nadeau, Royal J. Interim Report on Results of Sampling and Analysis Effort for the French Limited Abandoned Hazardous Waste Site. U.S. Environmental Protection Agency Memorandum. March 4, 1980.

Texas Bureau of Economic Geology. 1980. Environmental Geologic Atlas of the Texas Coastal Zone. Galveston-Houston Area. Austin, Texas.

Texas Department of Water Resources. Interoffice Memorandum from Clarence Johnson to Dick Whittington. December 11, 1979.

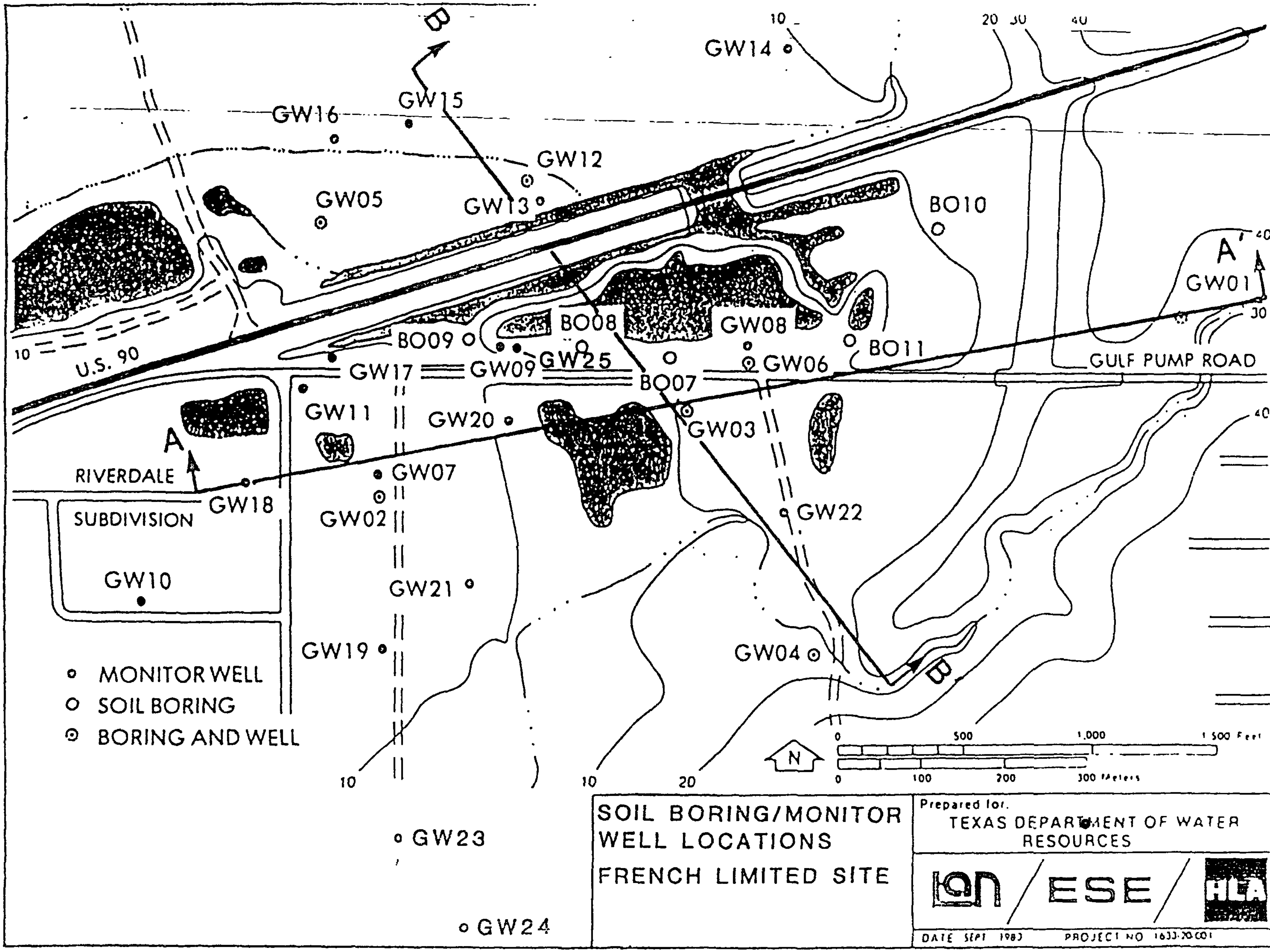
Texas Surface Water Quality Standards, Texas Administrative Code, Title 31, Chapter 333, Sections 11-21, as amended April 14, 1981.

Texas Water Quality Board. Interoffice Memorandum from Tom Kearns to George Green. July 9, 1976.

Texas Water Quality Board Public Hearing Record. February 22, 1971.

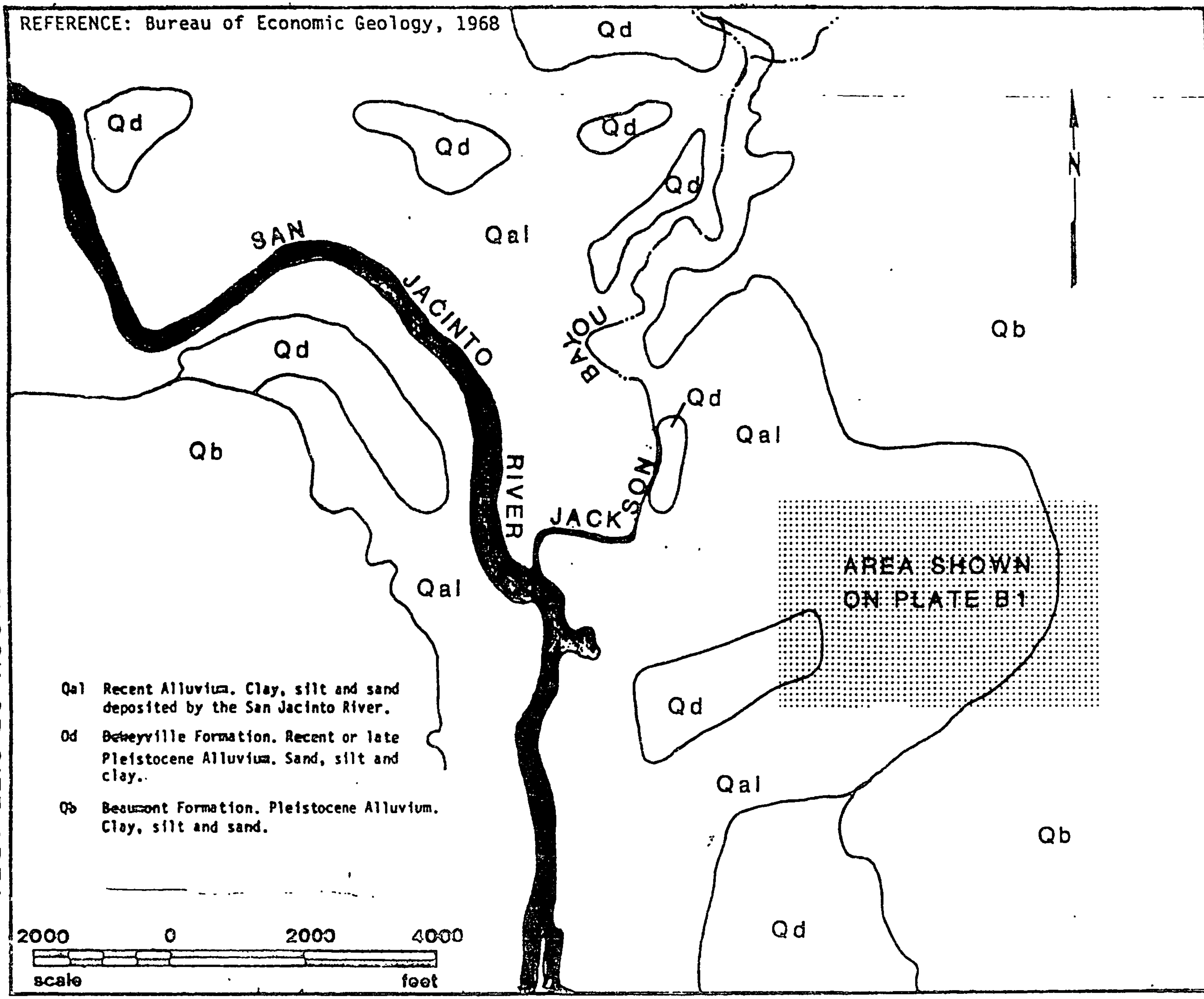
U.S. Environmental Protection Agency. 1980. Water Quality Criteria Documents, Availability. Federal Register 45, No. 231, pp. 79218-79379. Nobember 28, 1980. Washington, D.C.

BOOKMARK



SOIL BORING/MONITOR WELL LOCATIONS
FRENCH LIMITED SITE
Prepared for.
TEXAS DEPARTMENT OF WATER RESOURCES
ESE
HLA
DATE SEPT 1983
PROJECT NO 1633-20-001
MONITOR WELL
SOIL BORING
BORING AND WELL
U.S. 90
GULF PUMP ROAD
RIVERDALE SUBDIVISION
GW01
GW02
GW03
GW04
GW05
GW06
GW07
GW08
GW09
GW10
GW11
GW12
GW13
GW14
GW15
GW16
GW17
GW18
GW19
GW20
GW21
GW22
GW23
GW24
GW25
BO07
BO08
BO09
BO10
BO11
A
A'
B
B'
N
0
500
1,000
1,500 Feet
100
200
300 Meters
10
20
30
40

PLATE B-1

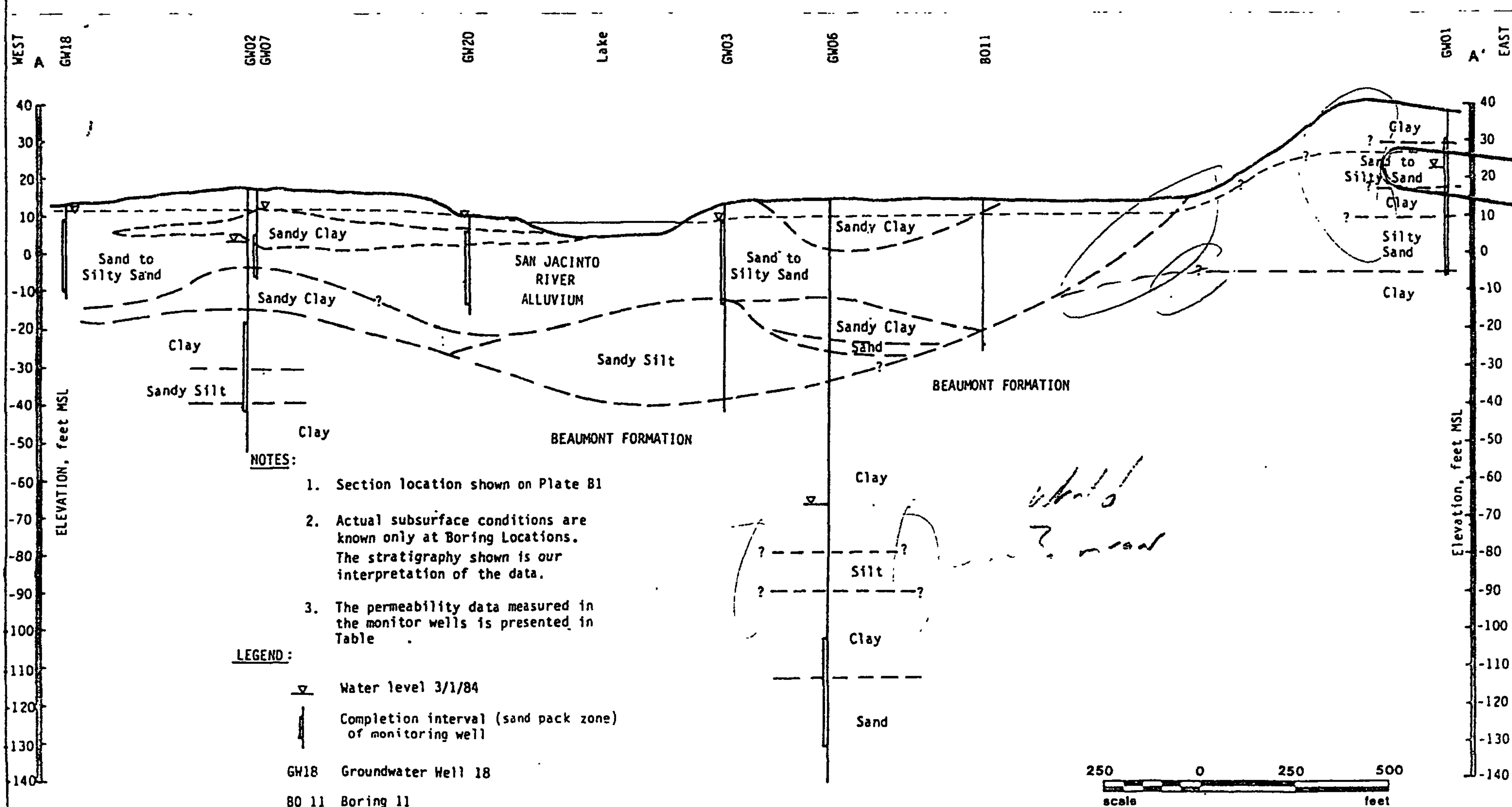


Harding Lawson Associates
Engineers Geologists & Geophysicists

SURFICIAL GEOLOGY OF SITE AREA
French Limited Site
Crosby, Texas

DRAWN D.K.K.
6013,009.12
APPROVED CBF
DATE 4-84
REVISED
DATE

PLATE B2



NOTES:

1. Section location shown on Plate B1
2. Actual subsurface conditions are known only at Boring Locations. The stratigraphy shown is our interpretation of the data.
3. The permeability data measured in the monitor wells is presented in Table .

LEGEND:

Water level 3/1/84

Completion interval (sand pack zone) of monitoring well

GW18 Groundwater Well 18

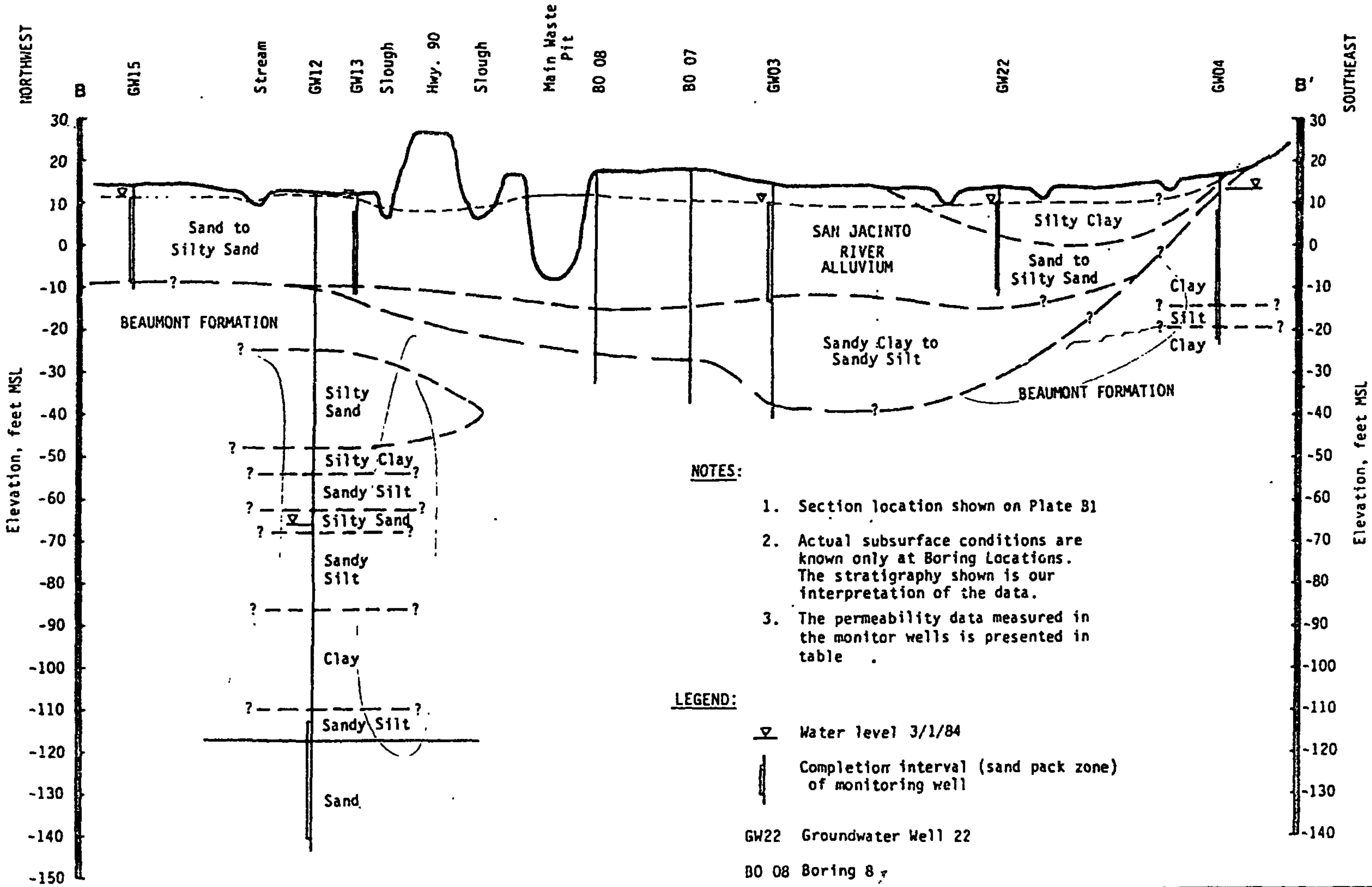
BO 11 Boring 11

Harding Lawson Associates
Engineers, Geologists & Geophysicists

SUBSURFACE PROFILE A-A'
French Limited Site
Crosby, Texas

PLATE B3

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
D.K.K.	6013,009.12	MPM	5/84		



NOTES:

1. Section location shown on Plate B1
2. Actual subsurface conditions are known only at Boring Locations. The stratigraphy shown is our interpretation of the data.
3. The permeability data measured in the monitor wells is presented in table .

LEGEND:

Water level 3/1/84

Completion interval (sand pack zone) of monitoring well

GW22 Groundwater Well 22

BO 08 Boring 8

250 0 250 500
scale feet

Harding Lawson Associates
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SUBSURFACE PROFILE B-B'
French Limited Site
Crosby, Texas

PLATE B4

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
D.K.K.	6013,009.12	MPM	5/84		

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			SYMBOL	TYPICAL NAMES
COARSE-GRAINED SOILS (MORE THAN HALF IS LARGER THAN #200 SIEVE)	GRAVELS — MORE THAN HALF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE SIZE	CLEAN GRAVELS WITH LITTLE OR NO FINES	GW	WELL GRADED GRAVELS, GRAVEL-SAND MIXTURES
			GP	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES
		GRAVELS WITH OVER 12% FINES	GM	SILTY GRAVELS, POORLY GRADED GRAVEL-SAND-SILT MIXTURES
			GC	CLAYEY GRAVELS, POORLY GRADED GRAVEL-SAND-CLAY MIXTURES
	SANDS — MORE THAN HALF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE SIZE	CLEAN SANDS WITH LITTLE OR NO FINES	SW	WELL GRADED SANDS, GRAVELLY SANDS
			SP	POORLY GRADED SANDS, GRAVELLY SANDS
		SANDS WITH OVER 12% FINES	SM	SILTY SANDS, POORLY GRADED SAND-SILT MIXTURES
			SC	CLAYEY SANDS, POORLY GRADED SAND-CLAY MIXTURES
FINE-GRAINED SOILS (MORE THAN HALF IS SMALLER THAN #200 SIEVE)	SILTS AND CLAYS LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS, OR CLAYEY SILTS WITH SLIGHT PLASTICITY
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
			OL	ORGANIC CLAYS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACIOUS FINE SANDY OR SILTY SOILS, ELASTIC SILTS
			CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS			Pt	PEAT AND OTHER HIGHLY ORGANIC SOILS

KEY TO TEST DATA

▭ — "Undisturbed" Sample	SA — Sieve Analysis
⊠ — Standard Penetration Test Sample	MA — Sieve Analysis w Hydrometer
LL — Liquid Limit (in %)	PERM — Permeability
PL — Plastic Limit (in %)	PID — Photo Ionization Detector (ppm)
PI — Plasticity Index (in %)	Blows/foot — refers to SPT "N" value
SG — Specific Gravity	Remold — Sample remolded prior to testing
#-200 — % Fines passing #200 sieve	

NOTES

These Notes Are Applicable To All Boring and/or Test Pit Log Plates in This Report.

1. Elevations refer to Mean Sea Level Datum (1963)
2. Undisturbed Samples consisted of hydralically pushed 3-inch diameter Shelby Tubes and driven 3-inch OD x 2.5-inch ID Split Spoon Samplers. A 140 lb. hammer falling 30-inches was used to drive the Split Spoon Sampler. Blow counts were converted to SPT "N" valves by multiplying by 0.56.
3. Standard Penetration Test is the number of blows required to drive a 2-inch OD by 1.3 inch ID Split Spoon Sampler 12-inches using a 140-lb. hammer falling 30 inches.
4. Borings were drilled with a 4-inch diameter fishtail bit.

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Engineers, Geologists & Geophysicists

SOIL CLASSIFICATION CHART AND KEY TO TEST DATA
French Limited Site

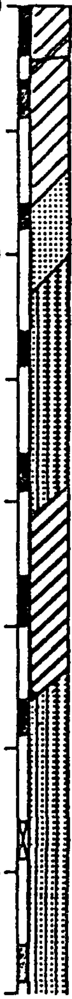
PLATE B5

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
LM	6013.009.12	MFM	:/84		

Equipment Auger/Rotary Wash

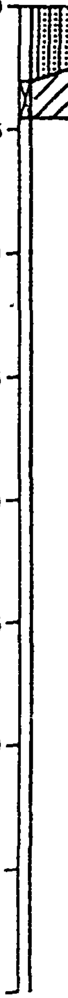
Elevation 37.8 feet Date 4/6/83

Laboratory Tests	PID (ppm)	Blows/foot	Moisture Content (%)	Dry Density (pcf)	Depth (ft)	Description
					0	BROWN SILTY CLAY (CH) stiff, wet
	5					LIGHT BROWN AND RED CLAY (CH) very stiff, wet
					5	
SA(-#200=47%)		15	11.7	97		LIGHT BROWN SAND (SP) medium dense, moist, fine grained, some silty sand seams
					10	LIGHT BROWN SILTY SAND (SM) medium dense, moist, fine-grained
		26				
					15	
		23				some clayey sand seams at 18 feet, saturated below 17 feet
					20	LIGHT BROWN AND GRAY CLAY (CH) very stiff, saturated
					25	
						LIGHT BROWN SILTY SAND (SM) medium dense, saturated
					30	
		30				some clay seams at 33 feet
					35	
		24				
					40	



(Continuation of Log)

Laboratory Tests	PID (ppm)	Blows/foot	Moisture Content (%)	Dry Density (pcf)	Depth (ft)	Description
					40	
		44				RED-BROWN CLAY (CH) very stiff, saturated
					45	End of Boring - 44.5 feet E-logged boring prior to reaming. Reamed boring with 8-inch bit to 45 feet. Installed 4-inch diameter PVC well to 45 feet. Screened from 15 to 45 feet. Sand backfill from 7 to 45 feet.
					50	
					55	
					60	
					65	
					70	
					75	
					80	



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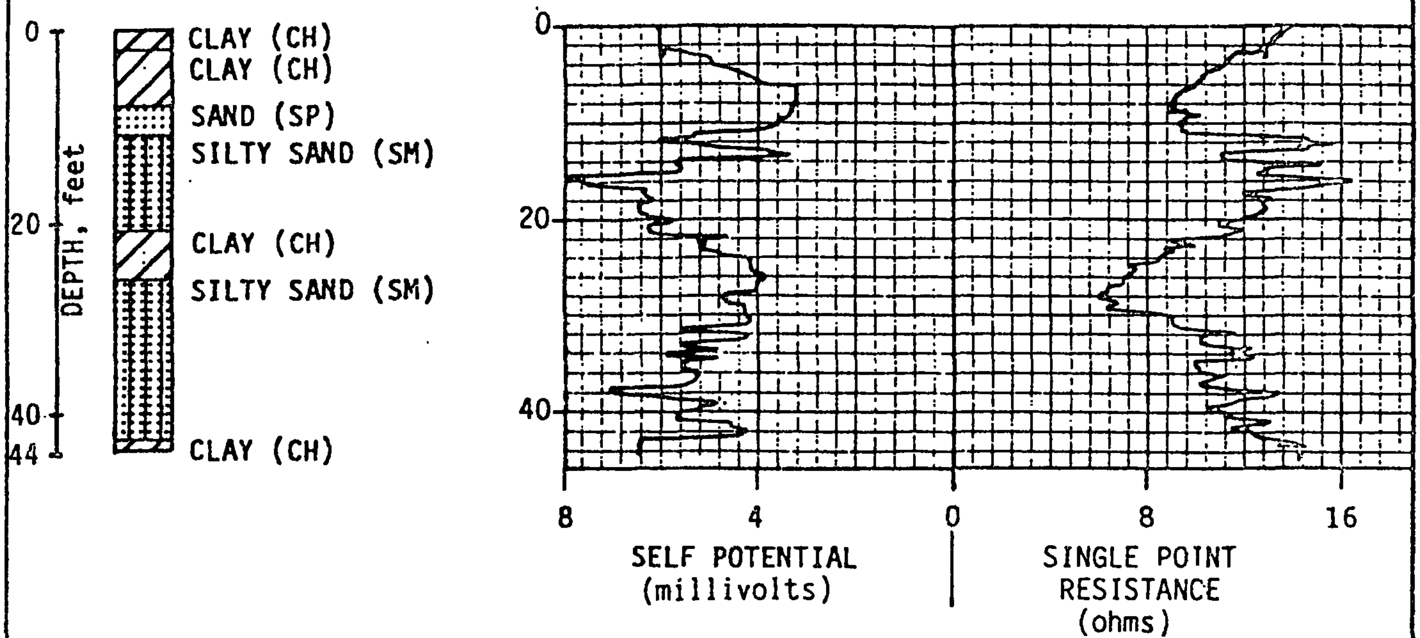
LOG OF BORING B1 / GW1
French Limited Site
Crosby, Texas

PLATE B6

DRAWN HM | JOB NUMBER 6013,008.12 | APPROVED MPM | DATE 5/84 | REVISED | DATE



NOTES:

1. Self Potential Run In Positive Mode

Harding Lawson Associates	GEOPHYSICAL LOG OF B1/GW1 French Limited Site Crosby, Texas	PLATE B7

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
LM	6013,009.12	MPM	5/84		

Equipment Auger/Rotary Wash

Elevation 17.6 feet Date 4/7/83

Laboratory Tests	PID (ppm)	Blows/foot	Moisture Content (%)	Dry Density (pcf)	Depth (ft)	Description
					0	DARK GRAY CLAYEY SAND (SC) loose, moist
		21				LIGHT BROWN SAND (SP) medium dense, wet, fine to medium grained, trace silt
					5	
						LIGHT GRAY SANDY CLAY (CH) stiff, wet
					10	
						increased sand content at 12 feet
SA(-#200=46%)	<1					LIGHT GRAY SILTY SAND (SM) medium dense, saturated, trace clay, fine grained
					15	
		21				
					20	LIGHT GRAY AND YELLOW SANDY CLAY (CL) very stiff, saturated
LL=35 PL=17 PI=18	<1		14.5	114		
					25	
						slightly sandy at 28 feet
					30	
						RED-BROWN CLAY (CH) very stiff, saturated, blocky, slickensided
LL=69 PL=32 PI=37			24.1	96		
					35	
						color changes to light gray and yellow at 38 feet, slightly sandy, occasional silty sand seams below 39 feet
					40	

(Continuation of Log)

Laboratory Tests	PID (ppm)	Blows/foot	Moisture Content (%)	Dry Density (pcf)	Depth (ft)	Description
					40	
			19.2	107		occasional silty sand layers
					45	
						LIGHT GRAY SANDY SILT (ML) very dense, saturated, non-plastic, trace clay, fine grained
SA(-#200=51%) SG=2.66	<1	67				
					50	
Perm $K=1.2 \times 10^{-6}$ (Remold)		50/6"	18.3	108		
					55	RED-BROWN CLAY (CH) very stiff, saturated, slickensided
LL=56 PL=27 PI=29			21.6	98		
					60	
						color changes to gray with some silt lenses
					65	
			22.9	96		
					70	End of Boring - 70 feet E-logged boring prior to reaming. Reamed boring with 8-inch bit to 58 feet. Installed 4-inch diameter PVC well to 58 feet. Screened from 38 to 58 feet. Sand backfilled from 36 to 58 feet.
					75	
					80	

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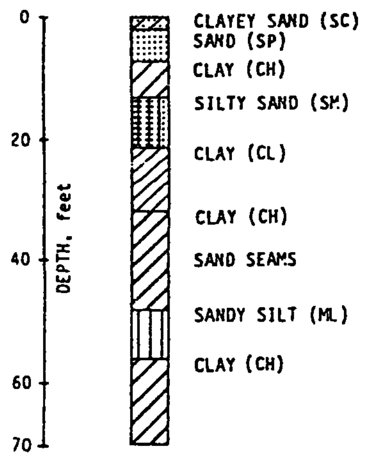
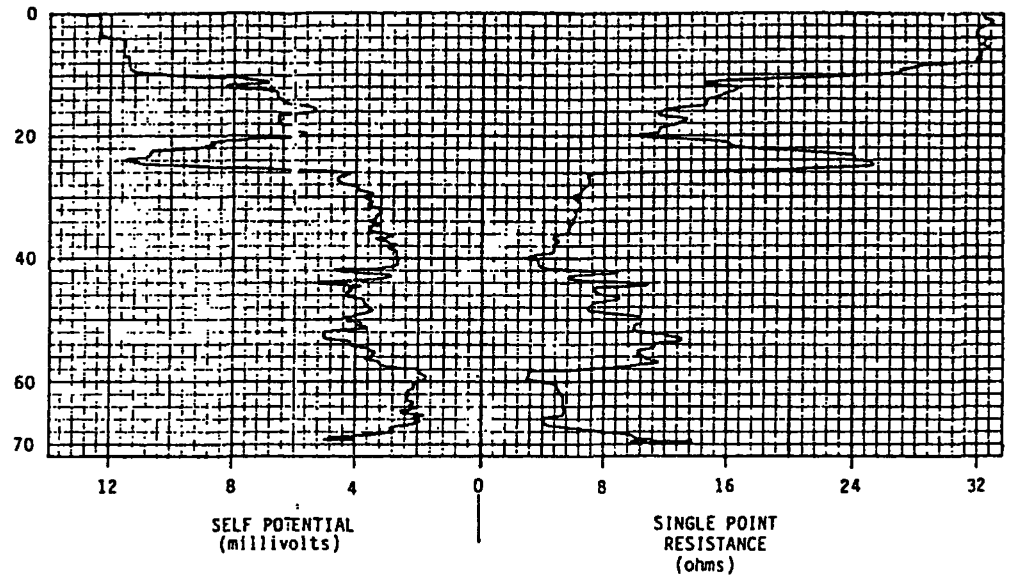
LOG OF BORING B2 / GW2
French Limited Site
Crosby, Texas

PLATE B8

DRAWN: LM | JOB NUMBER: 6013,009.12 | APPROVED: MPM | DATE: 5/84 | REVISED: | DATE:





NOTES:

1. Self Potential Run In Positive Mode

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GEOPHYSICAL LOG OF A B2/GW2
French Limited Site
Crosby, Texas

PLATE B9

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
LM	6013,009.12	MPM	5/84		

Equipment Auger/Rotary Wash
Elevation 13.2 feet Date 4/14/83

Laboratory Tests	PID (ppm)	Blows/foot	Moisture Content (%)	Dry Density (pcf)	Depth (ft)	Description
					0	GRAY CLAYEY SAND (SC) medium dense, moist
						LIGHT BROWN SAND (SP) medium dense, saturated, medium-fine grained with some clayey sand seams at 3 feet
	1	13				
					5	
SG=2.65 SA(-#200=5%)	1	25				
					10	
Perm K=4.0 x 10^{-3} (Remold)		42	17.6	102		
					15	
	1	50/7"				with some gravel seams with trace clay below 18 feet
					20	
SA(-#200=3%)	1	48				
					25	LIGHT GRAY SANDY SILT (ML) medium dense, saturated, non-plastic, trace clay, fine grained
	1.5					
					30	
	1		15.3	112		
					35	
	1		19.0	101		
					40	

(Continuation of Log)

Laboratory Tests	PID (ppm)	Blows/foot	Moisture Content (%)	Dry Density (pcf)	Depth (ft)	Description
					40	
	1.5					
					45	
	1.2		17.0	109		
					50	
	2.0		26.7	92		RED-BROWN CLAY (CH) very stiff, saturated
					55	End of Boring - 55 feet Reamed boring with 8-inch bit to 27 feet. Installed 4-inch diameter PVC well to 27-feet. Screened from 7 to 27 feet. Sand backfill from 5 feet to 27 feet. Well gamma logged after completion
					60	
					65	
					70	
					75	
					80	

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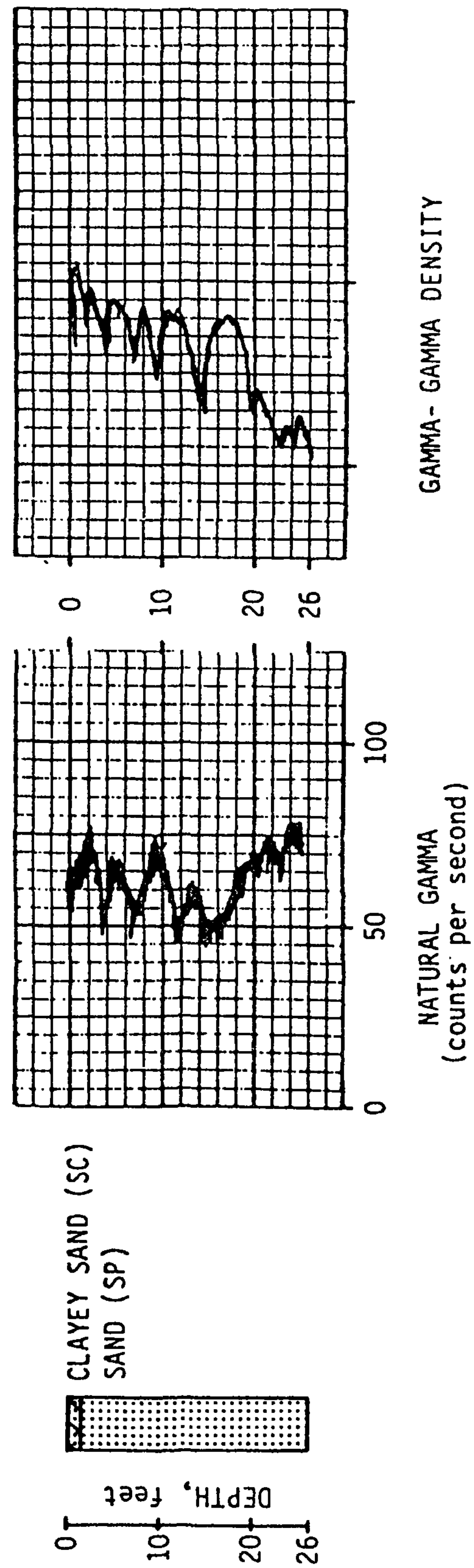
LOG OF BORING B3 / GW3
French Limited Site
Crosby, Texas

PLATE B10

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
RM	6013,009.12	MPM	5/84		



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GEOPHYSICAL LOG OF GW3
French Limited Site
Crosby, Texas

PLATE
B11

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
LM	6013,009.12	MPM	5/84		

Equipment Auger/Rotary Wash

Elevation 16.8 feet Date 4/7/83

Laboratory Tests	PID (ppm)	Blows/foot	Moisture Content (%)	Dry Density (pcf)	Depth (ft)	Description
					0	BROWN SANDY CLAY (CL) medium stiff, wet, with roots
						BROWN-GRAY SILTY SAND (SM) loose, wet
					5	BROWN CLAY (CH) stiff, wet, trace sand
						LIGHT GRAY AND YELLOW BROWN SANDY CLAY (CL) stiff, wet
					10	
			18.1	108		LIGHT BROWN AND GRAY CLAY (CH) very stiff, saturated, with some clacareous nodules, slickensided
					15	groundwater seepage at 13 feet
						color changes to red-brown at 18 feet
					20	
			14.8	112		some interbedded fine-grained silty sand seams at 23 feet
					25	
LL=33 PL=17 PI=16 Perm K=3.5 x 10^{-6}	<1		16.8	111		LIGHT GRAY AND YELLOW SILTY CLAY (CL) very stiff, saturated
					30	LIGHT GRAY SILT (ML) medium dense, saturated, non-plastic, with some clayey sand seams
SA(-#200=96%)		23				
					35	
						RED-BROWN LIGHT GRAY SANDY CLAY (CH) very stiff, saturated
					40	End of Boring - 40 feet

E-logged boring prior to reaming. Reamed boring with 8-inch bit to 39 feet. Installed 4-inch diameter PVC well to 39 feet. Screened from 9 to 39 feet. Sand backfill from 8 to 39 feet.

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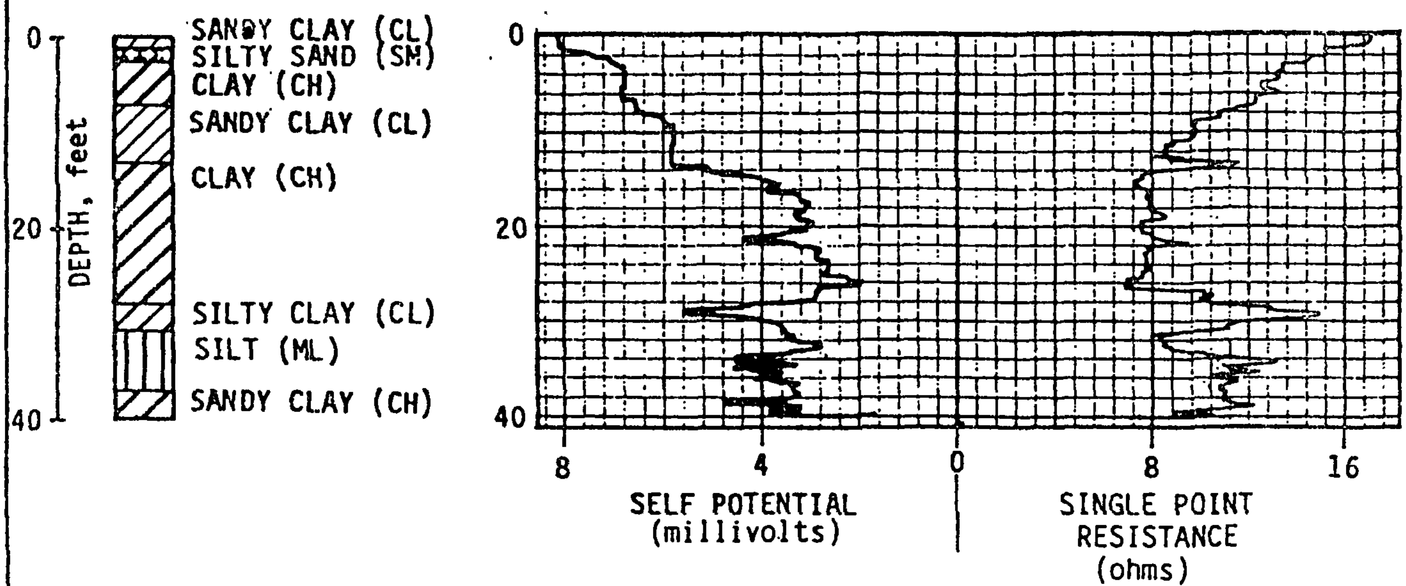
LOG OF BORING B4 / GW4
French Limited Site
Crosby, Texas

PLATE B12

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
LM	6013,009.12	MPM	5/84		



NOTES:

1. Self Potential Run In Positive Mode.

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GEOPHYSICAL LOG OF B4/GW4

French Limited Site

Crosby, Texas

PLATE B13

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
LM	6013,009.12	MPM	5/84		

Equipment: Auger/Rotary Wash

Elevation: 12.6 feet Date: 4/11/83

Laboratory Tests	PID (ppm)	Blows/foot	Moisture Content (%)	Dry Density (pcf)	Depth (ft)	Description
	1				0	BROWN CLAYEY SAND (SC) loose, wet
						LIGHT BROWN SAND (SP-SM) medium dense, saturated, trace silt, fine-medium grained
SA(-#200=9%) Perm K=1.7 x 10^{-3}		12	19.1	116		
					5	
						slightly clayey at 8 feet
	0.5	11				
					10	
						some clayey sand seams at 13 feet
	< 1	10				
					15	becomes more coarse grained at 15 feet
SA(-#200=2%)	1	14				
					20	
						RED-BROWN AND LIGHT GRAY CLAY (CH) stiff, saturated, slickensided
	< 1					
					25	
						LIGHT GRAY SANDY CLAY (CL) stiff, saturated, with some clayey sand layers
MA(-#200=73%) Perm K=9.6 x 10^{-5}	< 1		16.3	104		
					30	End of Boring - 30 feet Reamed boring with 8-inch bit to 25 feet. Installed 4-inch diameter PVC well to 25 feet. Screened from 5 to 25 feet. Sand backfill from 4 to 25 feet.
					35	
					40	

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LOG OF BORING B5 / GW5

French Limited Site
Crosby, Texas

PLATE B14

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
LM	6013,009.12	MPM	5/84		

Equipment Auger/Rotary Wash

Elevation 13.9 feet Date 4/12/83

Laboratory Tests	PID (ppm)	Blows/foot	Moisture Content (%)	Dry Density (pcf)	Depth (ft)	Sample	Description
					0		GRAY SANDY CLAY (CH) stiff, wet
	0.6		20.1	97	5		
			21.3	100	10		
	0				15		LIGHT GRAY SILTY SAND (SM) medium dense, saturated, fine grained
	1						LIGHT GRAY CLAYEY SAND (SC) loose, saturated, fine grained
					20		
	4	30			25		decreased clay content, medium dense, some gravel, some odor at 23 feet
							RED-BROWN CLAY (CH) very stiff, saturated, blocky, with some silt and sand laminations
	0		34.9	91	30		
	1				35		LIGHT GRAY AND YELLOW SANDY CLAY (CL) very stiff, saturated, with some clayey sand seams
	1				40		LIGHT GRAY CLAYEY SAND (SC) medium dense, saturated

Laboratory Tests	PID (ppm)	Blows/foot	Moisture Content (%)	Dry Density (pcf)	Depth (ft)	Sample	(Continuation of Log)
					40		LIGHT GRAY SANDY SILT (ML) medium dense, saturated, non-plastic, fine grained
SA(-#200=59%) Perm K=2.7 x 10^{-3}	1				45		
							RED-BROWN CLAY (CH) very stiff, saturated, blocky
LL=55 PL=24 PI=31			27.9	94	50		
	1				55		with some fine grained silty sand laminations below 53 feet
	1		31.3	89	60		color changes to gray-brown increased silt content
	1				65		sand seam 65 to 67 feet
	1				70		LIGHT GRAY-GREEN SANDY CLAY (CH) very stiff, saturated
LL=56 PL=24 PI=32	1		23.0	101	75		RED-BROWN AND LIGHT GRAY CLAY (CH) very stiff to hard, saturated, slickenside, with calcareous nodules
	1				80		

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LOG OF BORING B6 / GW6
French Limited Site
Crosby, Texas

PLATE B15

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
LM	6013,009.12	MPM	5/84		

Laboratory Tests	PID (ppm)	Blows/Foot	Moisture Content (%)	Dry Density (pcf)	Depth (ft)	(Continuation of Log)
			23.2	99	80–85	silty sand layer at 84 feet
					85	RED-BROWN CLAY (CH) very stiff to hard, saturated, slickensided with some fine grained silty sand laminations
	<1				90	
SA(-#200=87%)					92–95	GRAY SANDY SILT (ML) dense, saturated, fine grained, non-plastic, some silt layers
	2				100	
LL=48 PL=20 PI=28		18	30.2	91	103–105	BLUE-GRAY CLAY (CL) stiff, saturated
	2				112–115	LIGHT GRAY AND YELLOW SANDY CLAY (CL) very stiff, saturated, with some clayey sand seams

Laboratory Tests	PID (ppm)	Blows/Foot	Moisture Content (%)	Dry Density (pcf)	Depth (ft)	(Continuation of Log)
	2.8				120–125	
					127	LIGHT GRAY SAND (SM) very dense, saturated, some silt, fine grained
		50/5"			133	
SG=2.67 SA(-#200=15%)	10	25/1"			143	
	2	48			153	increased clay content with some sand and clay laminations, dense at 153 feet

End of Boring - 154.5 feet
E-logged boring prior to reaming. Reamed boring with 8-inch bit to 145 feet. Installed 4-inch diameter PVC well to 142 feet. Screened from 127 to 142 feet. Sand backfill from 116 to 145 feet. Well plugged on 4-12-84.

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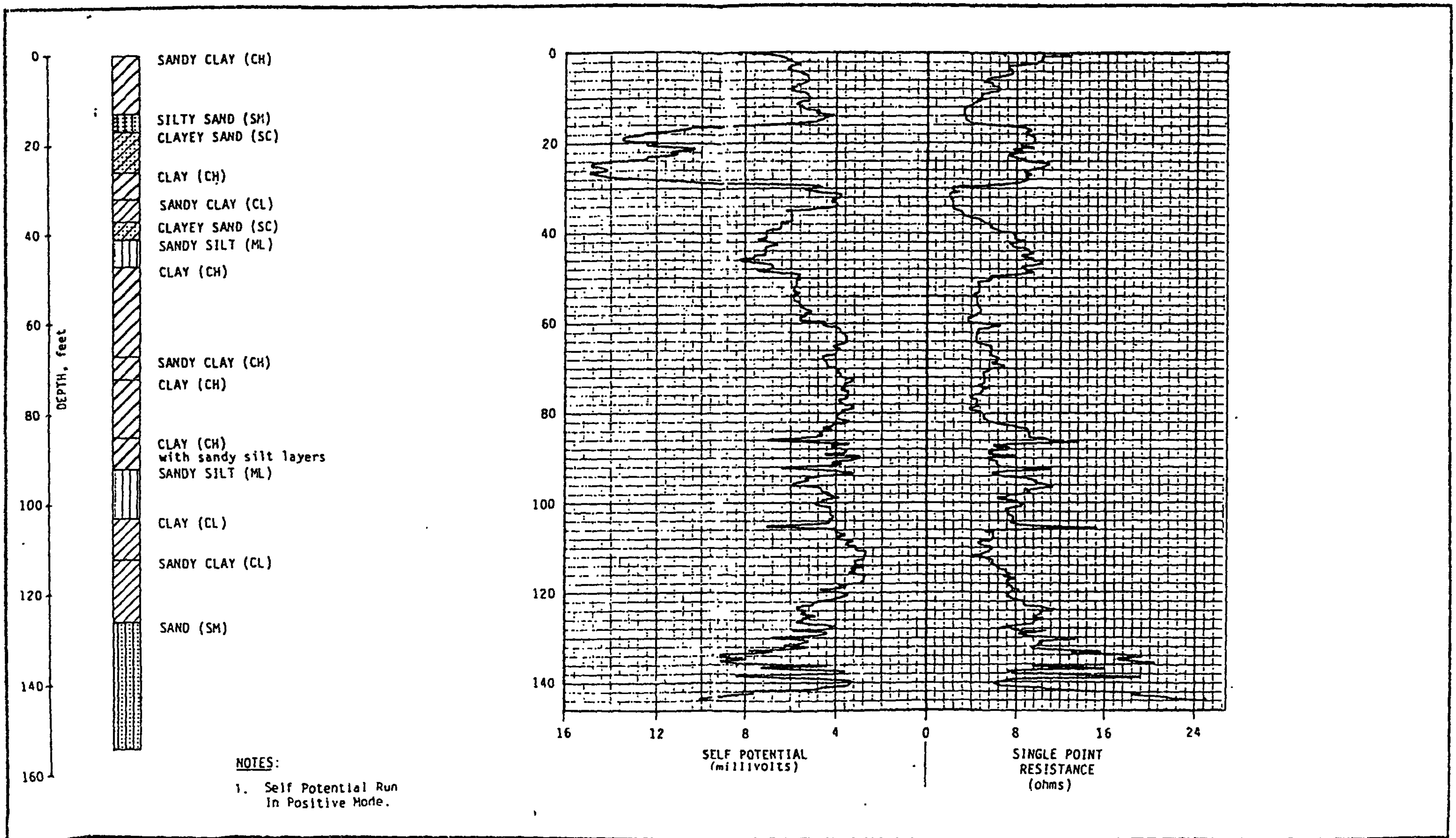
LOG OF BORING B6 / GW6
French Limited Site
Crosby, Texas

PLATE B16

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
WM	6013,009.12	MPM	6/10/83		



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GEOPHYSICAL LOG OF B6/GW6
French Limited Site
Crosby, Texas

PLATE B17

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
LM	6013,009.12	MPM	5/84		

Equipment Auger/Rotary Wash

Elevation 16.0 feet Date 4/5/83

Laboratory Tests	PID (ppm)	Blows/foot	Moisture Content (%)	Dry Density (pcf)	Depth (ft)	Description
					0	GRAY CLAYEY SAND (SC) loose, moist, with some clay pockets
					5	LIGHT BROWN SAND (SP) loose, wet, with some clayey sand seams, fine-grained, saturated below 4 feet
						becomes medium dense at 8 feet
		12			10	
Perm K=8.0 x 10^{-3} (Remold)		37	17.8	106	15	becomes dense at 12 feet fine to medium grained, some fine grained gravel seams below 13 feet.
SA(-#200=4%) SG=2.65		41			20	color changed to gray
						trace of clay at 23 feet
		38			25	
SA(-#200=3%)		51			30	
			19.3	106	35	LIGHT GRAY SANDY CLAY (CL) stiff, saturated, with clayey sand lenses
					40	

(Continuation of Log)

Laboratory Tests	PID (ppm)	Blows/foot	Moisture Content (%)	Dry Density (pcf)	Depth (ft)	Description
					40	
Perm K=6.6 x 10^{-5} SA(-#200=57%)			18.8	106	45	chemical odor at 44 feet
						RED-BROWN CLAY (CH) very stiff, saturated
LL=76 PL=25 PI=51			33.2	86	50	
					55	some silty sand laminations at 53 feet
						End of Boring - 55 feet E-logged boring. Backfilled to surface with cement/bentonite slurry.
					60	
					65	
					70	
					75	
					80	

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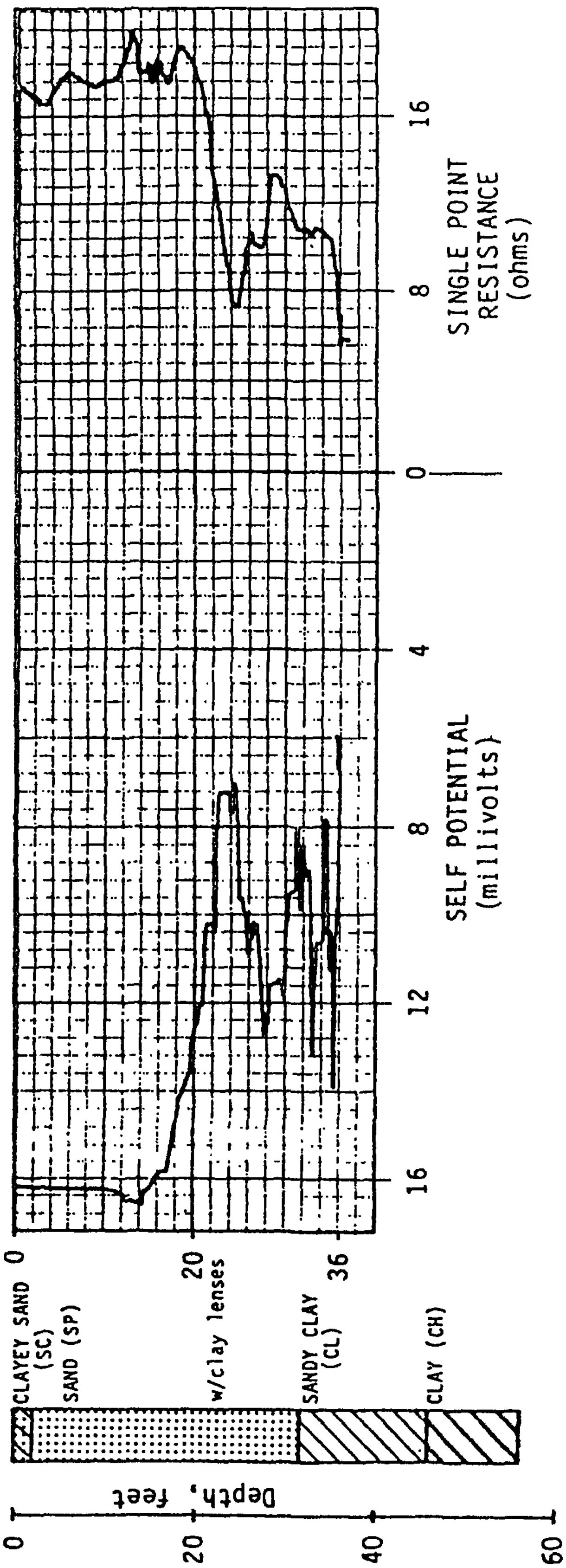
LOG OF BORING B-7
French Limited Site
Crosby, Texas

PLATE B18

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HM	6013,009.12	MPM	5/84		



NOTES:

1. Self Potential Run In Positive Mode.

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GEOPHYSICAL LOG OF B7

French Limited Site
Crosby, Texas

PLATE B19

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
LM	6013,009.12	MPM	5/84		

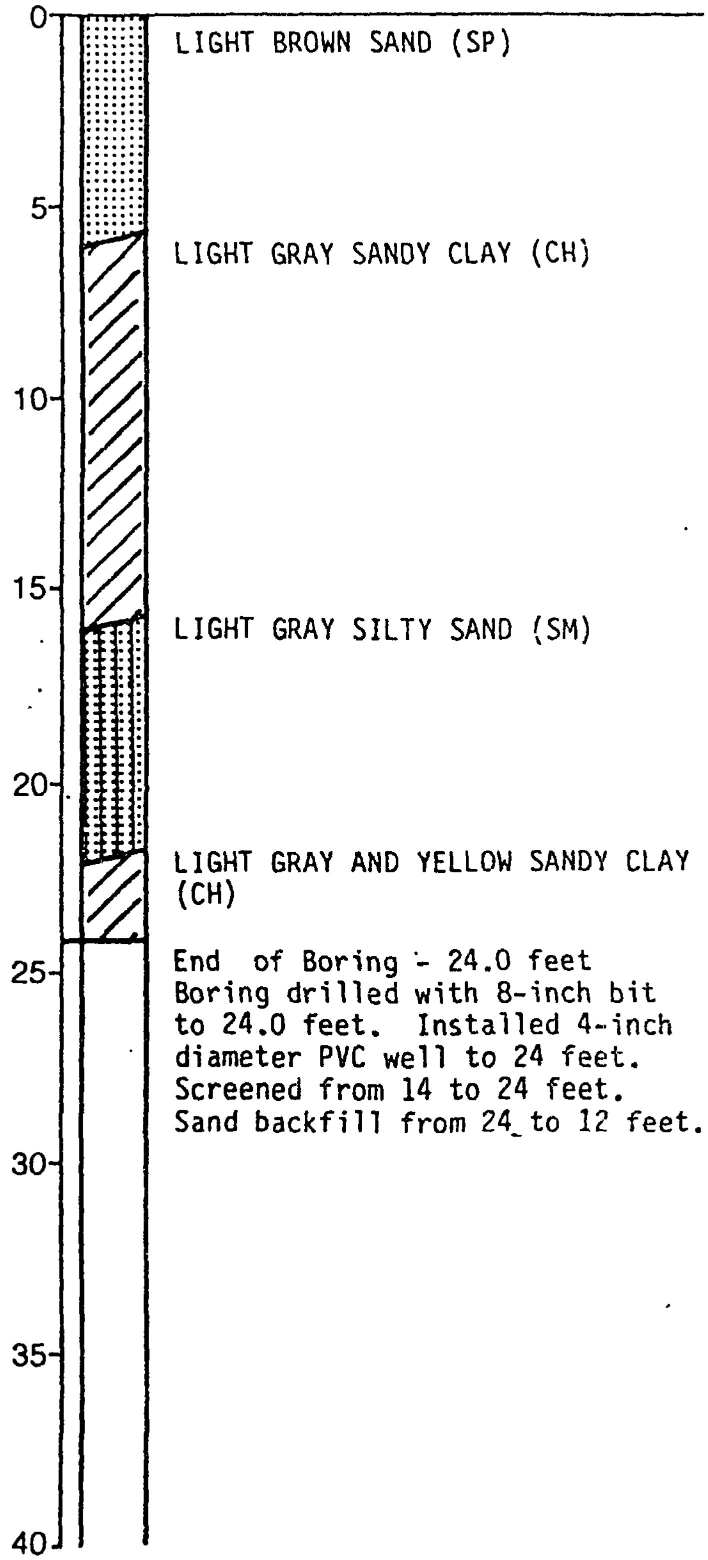
Laboratory Tests	PID (ppm)	Blows/foot	Moisture Content (%)	Dry Density (pcf)	Depth (ft)	Sample

Equipment Auger/Rotary Wash

Elevation 17.5 feet Date 4/8/83

NOTE:

B2/GW2 was drilled 20 feet from GW7. See B2/GW2 for detailed description of subsurface strata.



End of Boring - 24.0 feet
Boring drilled with 8-inch bit to 24.0 feet. Installed 4-inch diameter PVC well to 24 feet. Screened from 14 to 24 feet. Sand backfill from 24 to 12 feet.

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LOG OF BORING GW7
French Limited Site
Crosby, Texas

PLATE B20

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
LM	6013,009.12	MPM	5/84		

Laboratory Tests	PID (ppm)	Blows/foot	Moisture Content (%)	Dry Density (pcf)	Depth (ft)	Description
					0	Equipment: Auger/Rotary Wash; Elevation: 15.9 feet; Date: 4/5/83
					0	LIGHT BROWN CLAYEY SAND (SC) loose, moist, fill
		7				LIGHT BROWN SILTY SAND (SM) loose, wet, with some gray clay seams and some dark gray silty sand seams, fine grained
SA(-#200=20%) SG=2.66		23				color changes to gray, medium dense
	1.5	11				LIGHT GRAY CLAYEY SAND (SC) loose to medium dense, saturated, fine grained
		45				LIGHT GRAY SAND (SP) dense, saturated, fine-grained
		40				occasional clay lense and some darker gray layers at 23 feet
		35				clayey gravel seam at 28 feet
					30	LIGHT GRAY SANDY SILT (ML) dense, saturated, fine grained sand, trace clay
SA(-#200=70%) SG=2.65						
					40	

(Continuation of Log)

Laboratory Tests	PID (ppm)	Blows/foot	Moisture Content (%)	Dry Density (pcf)	Depth (ft)	Description
					40	
LL=29 PL=19 PI=10 Perm K=7.0 x 10^{-8}	< 1		17.5	117		GRAY CLAY (CL) very stiff, saturated
	< 1					LIGHT GRAY SANDY CLAY (CL) stiff, saturated, with some clayey sand seams
					50	End of Boring - 50 feet. E-logged boring. Backfilled to surface with cement/bentonite slurry.

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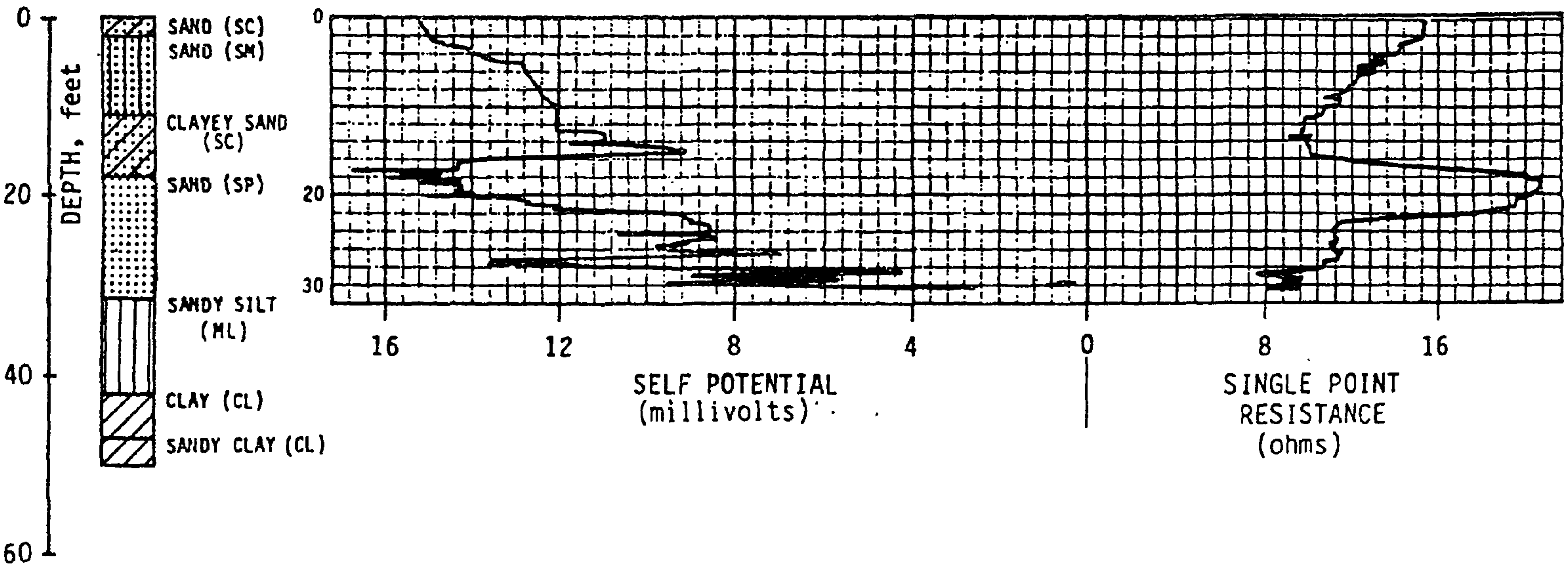
LOG OF BORING B8
French Limited Site
Crosby, Texas

PLATE B21

DRAWN: LM | JOB NUMBER: 6013,009.12 | APPROVED: MPM | DATE: 5/84 | REVISED | DATE



NOTES:

1. Self Potential Run In Positive Mode

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GEOPHYSICAL LOG OF B8
French Limited Site
Crosby, Texas

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE	PLATE
LM	6013,009.12	MPM	5/84			B22

Equipment Auger/Rotary Wash

Elevation 15.9 feet Date 4/5/83

Laboratory Tests	PID (ppm)	Blows/foot	Moisture Content (%)	Dry Density (pcf)	Depth (ft)	Description
LL=46 PL=19 PI-27			23.7	90	0	GRAY-BROWN SANDY CLAY (CL) stiff, wet with some sand layers at 3 feet
					5	LIGHT BROWN SILTY SAND (SM) loose, saturated, fine grained
	15	8				chemical odor at 9 feet
					10	LIGHT GRAY SILTY SAND (SM) loose, saturated, fine grained
MA(-#200=24%) SG=2.59					15	
		40				LIGHT GRAY SAND (SP) dense, saturated, fine grained
					20	
SA(-#200=34%)		50				with some fine grained gravel seams, well-graded silty sand at 23 feet
					25	
		27				becomes medium dense at 28 feet
					30	LIGHT GRAY CLAYEY SAND (SC) medium dense, saturated, fine grained, with some sandy clay pockets
					35	DARK GRAY SILTY SAND (SM) loose, saturated, fine grained, some chemical odor
SA(-#200=12%)	1				40	

(Continuation of Log)

Laboratory Tests	PID (ppm)	Blows/foot	Moisture Content (%)	Dry Density (pcf)	Depth (ft)	Description
					40	
					45	color change to light gray, some dark clay laminations, some yellow stains at 48 feet
	20				50	strong chemical odor at 50 feet
					55	
Perm $K=2.5 \times 10^{-7}$ LL=42 PL=20 PI=22	10		32.2	92		GRAY CLAY (CL) very stiff, saturated, slickensided, with sand lenses, strong chemical odor
					60	End of Boring - 59 feet E-logged boring. Backfilled with cement/bentonite slurry.
					65	
					70	
					75	
					80	

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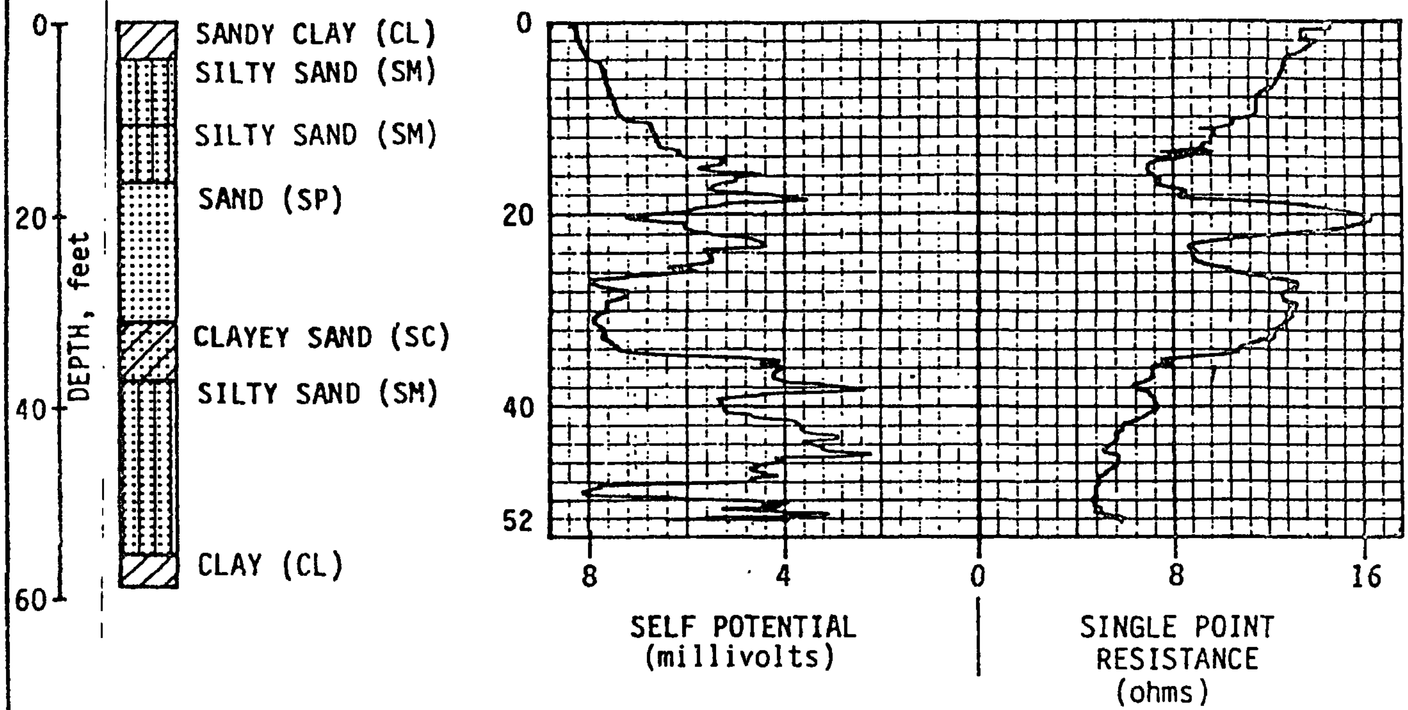
LOG OF BORING B9
French Limited Site
Crosby, Texas

PLATE B23

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
LM	6013,009.12	MPM	5/84		



NOTES:

1. Self Potential Run
   In Positive Mode

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GEOPHYSICAL LOG OF B9

French Limited Site
Crosby, Texas

PLATE
B24

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
LM	6013,009.12	MPM	5/84		

Equipment Auger/Rotary Wash

Elevation 10.1 feet Date 4/11/83

Laboratory Tests	PID (ppm)	Blows/foot	Moisture Content (%)	Dry Density (pcf)	Description
					GRAY CLAY (CH) stiff, saturated
					LIGHT GRAY SANDY SILT (ML) loose, saturated, fine grained
SA(-200=65%) Non-Plastic	1				
					LIGHT GRAY SILTY SAND (SM) loose, saturated, some wood fragments, trace clay, fine grained
	0.5	3			
SA(-#200=19%) Perm K=2.2 x 10^{-5} (Remold)		7	20.2	101	
	1.2	8			LIGHT BROWN AND GRAY CLAY (CH) stiff, saturated
LL=65 PL=22 PI=43	0.0		30.6	90	
	0.5				LIGHT BROWN SAND (SP) medium dense, saturated, fine grained

End of Boring - 35 feet
Backfilled with cement/ bentonite slurry.

Depth (ft): 0, 5, 10, 15, 20, 25, 30, 35, 40

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LOG OF BORING B10

French Limited Site
Crosby, Texas

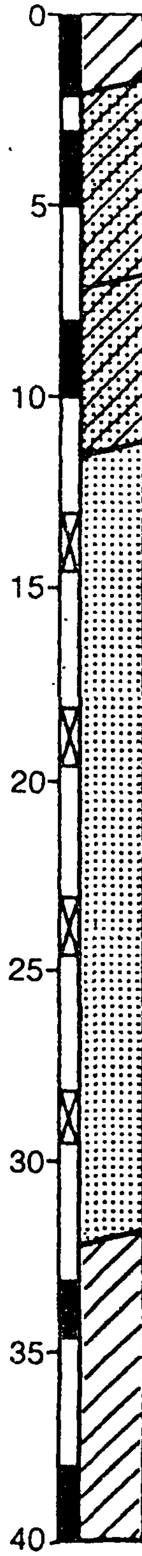
PLATE B25

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
LM	6013,009.12	MPM	5/84		

Equipment Auger/Rotary Wash

Elevation 14.1 feet Date 4/5/83

Laboratory Tests	PID (ppm)	Blows/foot	Moisture Content (%)	Dry Density (pcf)	Description
					GRAY-BROWN CLAY (CH) stiff, moist, some tarlike deposits
					DARK GRAY CLAYEY SAND (SC) loose, wet, with clay
					GRAY AND BROWN CLAYEY SAND (SC) medium dense, saturated, with sandy clay pockets
					LIGHT GRAY SAND (SP) medium dense, saturated, medium-fine grained
SA(-200=4%)		17			
	3	34			with some sandy clay seams, becomes dense at 18 feet
	7	51			some chemical odor at 23 feet
SA(-200=41%)		37			some gravelty silty sand seams at 28 feet
					RED-BROWN CLAY (CH) very stiff, saturated with interbedded silty sand seams below 33 feet
	1.				
					End of Boring - 40 feet
	0		18.6	110	E-logged boring Backfilled with a cement/bentonite slurry



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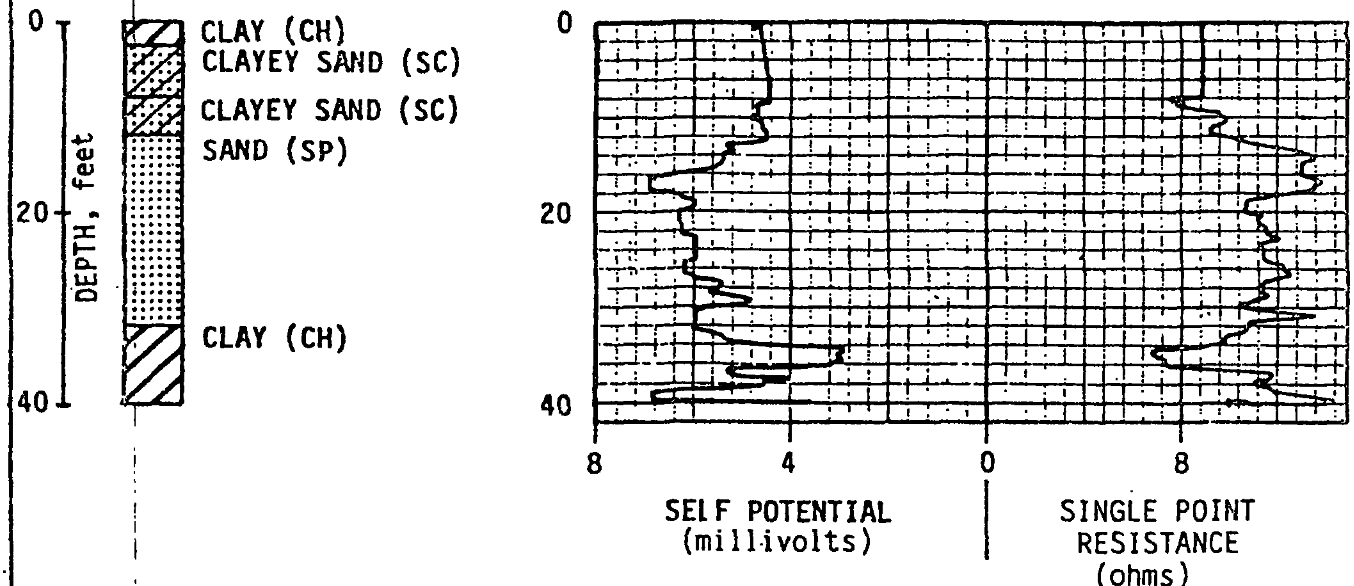
LOG OF BORING B11

French Limited Site
Crosby, Texas

PLATE B26

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
LM	6013,009.12	MPM	5/84		



NOTES:

1. Self Potential Run
In Positive Mode

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GEOPHYSICAL LOG B11

French Limited Site
Crosby, Texas

PLATE B27

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
LM	6013,009.12	MPM	5/84		

Equipment Rotary Wash

Elevation 11.50 Date 11/9/83

Laboratory Tests	Blows/foot	Moisture Content (%)	Dry Density (pcf)	Depth (ft)	Sample	Description
				0		0-3" DARK GRAY CLAYEY SAND (SC) WITH ABUNDANT ORGANICS (TOPSOIL)
						LIGHT GRAY SILTY SAND (SM) medium dense, wet, fine grained
				5		LIGHT GRAY SAND (SP) medium dense to dense, wet, fine to medium grained
	30			10		becomes coarser with depth
				15		
	23			20		medium dense at 20 feet
						RED BROWN CLAY (CH) stiff to very stiff, saturated
				25		
						red and gray sandy silt seam at 27 to 28 feet
				30		
				35		LIGHT GRAY AND WHITE SILTY SAND (SM) very dense, saturated
				40		

(Continuation of Log)

Laboratory Tests	Blows/foot	Moisture Content (%)	Dry Density (pcf)	Depth (ft)	Sample	Description
				40		
				45		LIGHT BROWN SILTY.SAND (SM) very dense, saturated, with organic odor, fine grained
	55			50		
				55		LIGHT GRAY SAND (SP) dense, saturated, fine to medium grained
	45			60		SILTY CLAY (CL) very stiff, saturated
				65		BLUE GRAY AND RED SILTY CLAY (CL) very stiff, saturated
	44			70		
				75		RED BROWN SILTY SAND (SM) saturated
	76			80		RED BROWN SANDY SILT (ML) very dense, saturated

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LOG OF BORING GW12
French Limited Site
Crosby, Texas

B28

DRAWN	JOB NUMBER	APPROVED	DATE
HM	6013,009.12	MPM	5/84

Laboratory Tests | Blows/Foot | Moisture Content (%) | Dry Density (pcf) | Depth (ft) | Sample | (Continuation of Log)

Blows/Foot	Depth (ft)	Description
	80	
	85	
54	90	RED BROWN SILTY CLAY (CL) very stiff, saturated
	95	
		BLUE GRAY CLAY (CH) very stiff, saturated
21	100	
	105	BLUE GRAY SILTY CLAY (CL) very stiff to hard, saturated
46	110	
	115	
		sand lenses at 118 feet
73	120	more silty at 120 feet

Laboratory Tests | Blows/Foot | Moisture Content (%) | Dry Density (pcf) | Depth (ft) | Sample | (Continuation of Log)

Boring drilled to 62 feet with 4-inch bit for sampling. Boring then augered to 62 feet with 8-inch bit. Casing set to 65 feet. Boring advanced 62 to 155 feet with 4-inch bit for sampling. Boring then augered to 155 feet with 8-inch bit. Installed 4-inch PVC well to 155 feet. Screened from 132 to 152 feet. Sand backfill 124 to 152 feet. Bentonite seal from 122.5 to 124 feet. Sand bentonite grout from 0 to 122.5 feet.

Blows/Foot	Depth (ft)	Description
	120	BLUE GRAY SANDY SILT (ML) very dense, saturated
	125	
65		BLUE GRAY SAND (SP) very dense, saturated, fine to medium grained, with occasional silty clay lenses
	130	
	135	
85	140	
	145	
100+	150	
	155	End of Boring - 155 feet
	160	

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LOG OF BORING GW12
French Limited Site
Crosby, Texas

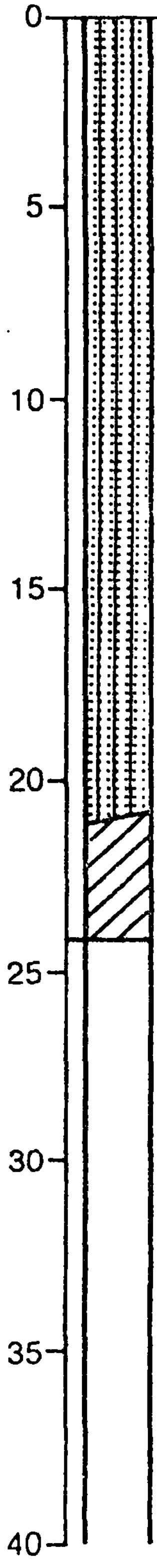
B29

Drawn: LM | Job Number: 6013.009.12 | Approved: MPM | Date: 5/84 | Revised | Date

Laboratory Tests	Pocket Penetrometer (ksf)	Blows/foot	Moisture Content (%)	Dry Density (pcf)	Depth (ft)	Sample

Equipment Rotary Wash

Elevation 11.6 Date 11/10/83



LIGHT BROWN SILTY SAND (SM)

LIGHT GRAY SANDY CLAY (CL)

End of Boring - 24 feet

Boring drilled with 4-inch bit to 24 feet. Installed 2-inch diameter PVC well to 24 feet. Screened from 4 to 24 feet. - Sand backfill from 4 to 24 feet.

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LOG OF BORING GW13

French Limited Site
Crosby, Texas

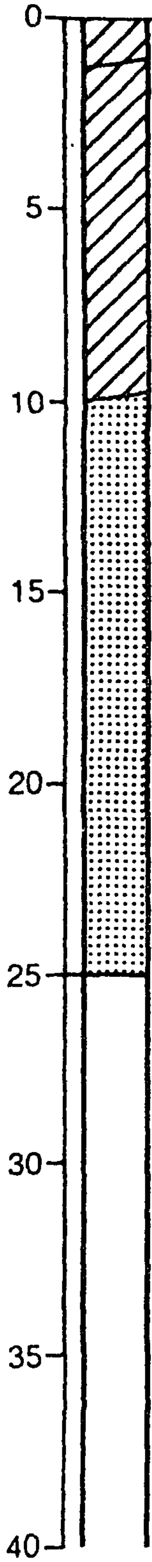
B30

DN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
	6013,009.12	MPM	5/84		

Laboratory Tests	Pocket Penetrometer (ksf)	Blows/foot	Moisture Content (%)	Dry Density (pcf)	Depth (ft)	Sample

Equipment Rotary Wash

Elevation 7.9 Date 11/9/83



DARK GRAY SANDY CLAY (CL)

MEDIUM GRAY SANDY CLAY (CL)

LIGHT GRAY SAND (SP)
fine to medium grained

End of Boring - 25 feet

Boring drilled with 4-inch bit to 25 feet. Installed 2-inch diameter PVC well to 23.5 feet. Screened from 3.5 to 23.5 feet. Sand backfill from 3.5 to 23.5 feet.

Well destroyed - not developed or sampled

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LOG OF BORING GW14

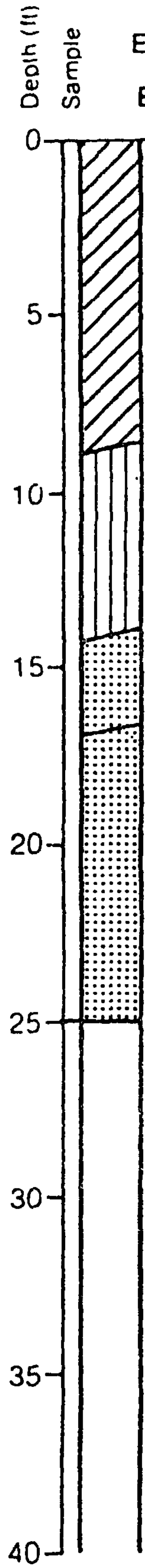
French Limited Site
Crosby, Texas

PLATE
B31

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
GM	6013,009.12	MPM	5/84		

Equipment Rotary Wash

Elevation 7.9 Date 12/12/83



DARK GRAY SANDY CLAY (CL)

DARK GRAY CLAYEY SILT (ML)

MEDIUM GRAY SAND (SP)

MEDIUM GRAY SAND (SP)
fine to medium grained

End of Boring at 25 feet

Boring drilled with 4-inch bit to 25 feet. Installed 2-inch diameter PVC well to 23.0 feet. Screened from 3.0 to 23.0 feet. Sand backfill from 2.5 to 23 feet. Boring drilled and piezometer installed to replace GW-14.

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LOG OF BORING GW14 R

French Limited Site
Crosby, Texas

B32

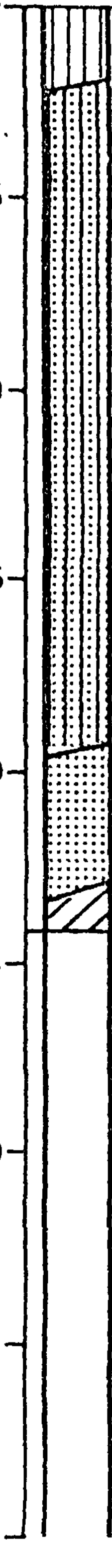
6013,009.12 MPM 5/84

Laboratory Tests	Pocket Penetrometer (ksf)	Blows/foot	Moisture Content (%)	Dry Density (pcf)	Depth (ft)	Sample

Equipment Rotary Wash

Elevation 13.8 Date 11/10/83

0
5
10
15
20
25
30
35
40



DARK GRAY CLAYEY SILT (ML)

LIGHT BROWN SILTY SAND (SM)

MEDIUM GRAY SAND (SP)
coarse grained

RED AND BROWN SILTY CLAY (CL)

End of Boring - 24 feet

Boring drilled with 2-inch bit to 24 feet. Installed 2-inch PVC to 23 feet. Screened from 3 to 23 feet. Sand backfill from 3 to 23 feet.

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LOG OF BORING GW15

French Limited Site
Crosby, Texas

PLATE

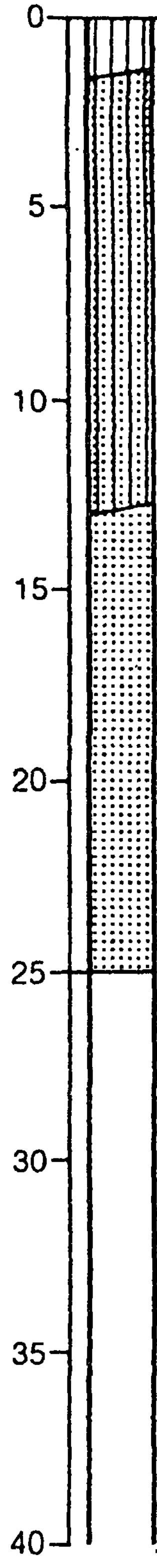
B33

DRAWN	NUMBER	APPROVED	DATE	REVISED	DATE
GM	6013,009.12	MPM	5/84		

Laboratory Tests	Pocket Penetrometer (ksf)	Blows/foot	Moisture Content (%)	Dry Density (pcf)	Depth (ft)	Sample

Equipment Rotary Wash

Elevation 12.5 Date 11/14/83



DARK GRAY SANDY SILT (ML)

LIGHT BROWN SILTY SAND (SM)
fine grained

LIGHT GRAY SAND (SP)
fine to medium grained

End of Boring - 25 feet

Boring drilled with 4-inch bit to 25 feet. Installed 2-inch diameter PVC well to 23.5 feet. Sand backfill from 3.5 to 23.5 feet. Screened from 3.5 to 23.5 feet.

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LOG OF BORING GW16

French Limited Site
Crosby, Texas

PLATE B34

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HM	6013,009.12	MPM	5/84		

Laboratory Tests	Pocket Penetrometer (ksf)	Blows/foot	Moisture Content (%)	Dry Density (pcf)	Depth (ft)	Sample

Equipment Rotary Wash

Elevation 16.2 Date 11/14/83

Depth (ft)	Description
0	LIGHT GRAY SAND (SP) fine to medium grained
25	End of Boring 25 feet Boring drilled with 4-inch bit to 25 feet. Installed 2-inch PVC well to 23 feet. Screened from 3 to 23 feet. Sand backfill from 3 to 23 feet.

Depth scale: 0, 5, 10, 15, 20, 25, 30, 35, 40

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LOG OF BORING GW17

French Limited Site
Crosby, Texas

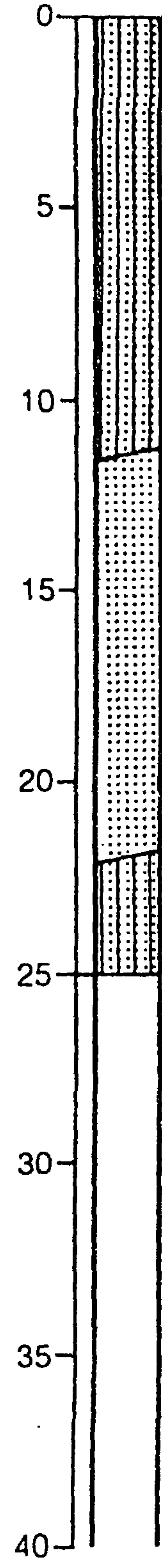
PLATE B35

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
hM	6013,009.12	MPM	5/84		

Laboratory Tests	Pocket Penetrometer (ksf)	Blows/foot	Moisture Content (%)	Dry Density (pcf)	Depth (ft)	Sample	

Equipment Rotary Wash

Elevation 13.5 Date 11/14/83



LIGHT BROWN SILTY SAND (SM)

LIGHT GRAY SAND (SP)
fine to medium grained

LIGHT GRAY SILTY SAND (SM)
with clay lenses

End of Boring - 25 feet

Boring drilled with 4-inch bit to 25 feet. Installed 2-inch diameter PVC well to 23.5 feet. Screened from 3.5 to 23.5 feet. Sand backfill from 3.5 to 23.5 feet.

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LOG OF BORING GW18

French Limited Site
Crosby, Texas

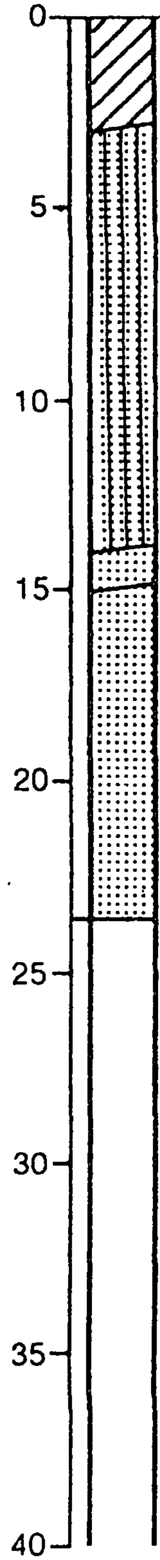
PLATE **B36**

DR	JOB NUMBER	APPROVED	DATE	REVISED	DATE
n	6013,009.12	MPM	5/84		

Laboratory Tests	Pocket Penetrometer (ksf)	Blows/foot	Moisture Content (%)	Dry Density (pcf)	Depth (ft)	Sample

Equipment Rotary Wash

Elevation 14.6 Date 11/8/83



DARK GRAY SILTY CLAY (CL)
with some organics

LIGHT BROWN SILTY SAND (SM)
with occasional clay lenses

BROWN FINE SAND (SP)

LIGHT BROWN SAND (SP)
fine to medium grained

End of Boring - 23.5 feet

Boring drilled with 4-inch bit to 23.5 feet. Installed 2-inch diameter PVC well to 23.5 feet. Screened from 3.5 to 23.5 feet. Sand backfill from 3.5 to 23.5 feet.

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LOG OF BORING GW19

French Limited Site
Crosby, Texas

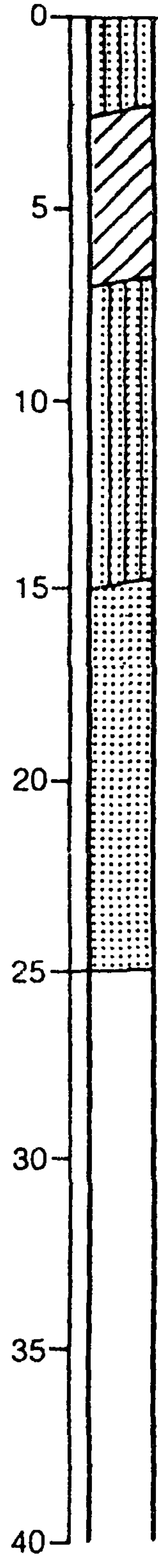
PLATE
B37

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
M	6013,009.12	MPM	5/84		

Laboratory Tests	Pocket Penetrometer (ksf)	Blows/foot	Moisture Content (%)	Dry Density (pcf)	Depth (ft)	Sample

Equipment Rotary Wash

Elevation 9.0 Date 11/8/83



LIGHT BROWN SILTY SAND (SM)

DARK GRAY SILTY CLAY (CL)
with organic odor

LIGHT BROWN SILTY SAND (SM)

LIGHT BROWN SAND (SP)
fine to medium grained

End of Boring - 25 feet

Boring drilled with 4-inch bit to 25 feet. Installed 2-inch diameter PVC well to 23 feet. Screened from 3 to 23 feet. Sand backfill from 3 to 23 feet.

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LOG OF BORING GW20

French Limited Site
Crosby, Texas

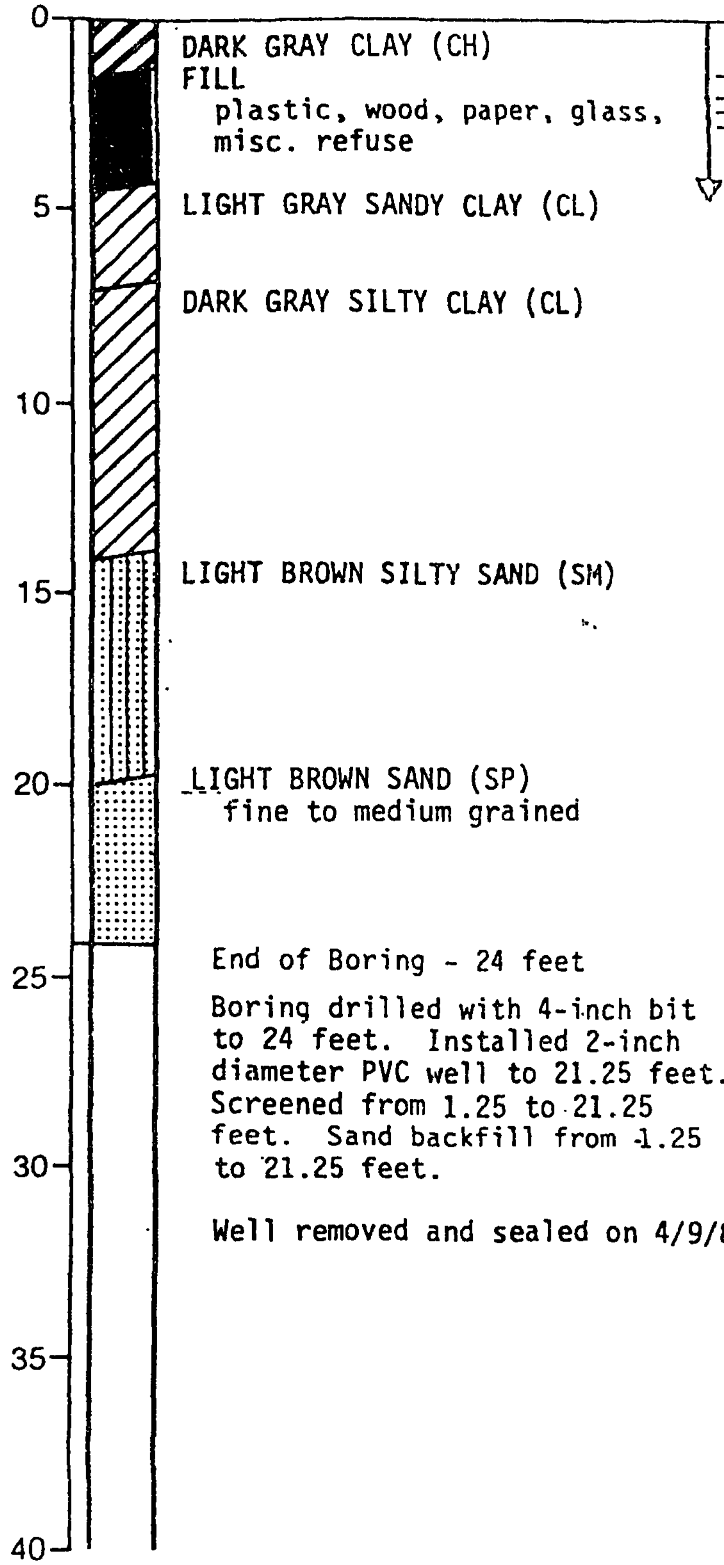
PLATE B38

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
hm	6013,009.12	MPM	5/84		

Laboratory Tests	Pocket Penetrometer (ksf)	Blows/foot	Moisture Content (%)	Dry Density (pcf)	Depth (ft)	Sample

Equipment Rotary Wash

Elevation 12.1 Date 11/8/83



DARK GRAY CLAY (CH)
FILL
plastic, wood, paper, glass, misc. refuse

LIGHT GRAY SANDY CLAY (CL)

DARK GRAY SILTY CLAY (CL)

LIGHT BROWN SILTY SAND (SM)

LIGHT BROWN SAND (SP)
fine to medium grained

End of Boring - 24 feet

Boring drilled with 4-inch bit to 24 feet. Installed 2-inch diameter PVC well to 21.25 feet. Screened from 1.25 to 21.25 feet. Sand backfill from 1.25 to 21.25 feet.

Well removed and sealed on 4/9/84

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LOG OF BORING GW21
French Limited Site
Crosby, Texas

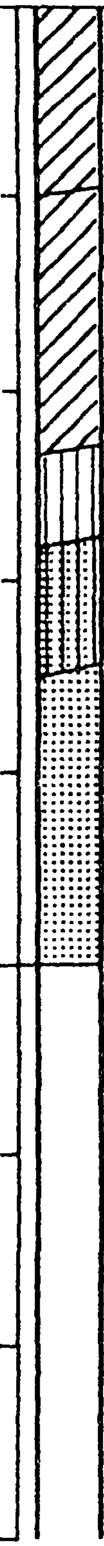
PLATE B39

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
km	6013,009.12	MPM	5/84		

Laboratory Tests	Pocket Penetrometer (ksf)	Blows/foot	Moisture Content (%)	Dry Density (pcf)	Depth (ft)	Sample

Equipment Rotary Wash

Elevation 13.2 Date 11/14/83



Depth (ft)	Description
0	DARK GRAY SANDY SILTY CLAY (CL)
5	LIGHT GRAY SILTY CLAY (CL)
10	
	LIGHT GRAY CLAYEY SILT (ML)
	LIGHT GRAY SILTY SAND (SM)
15	
	LIGHT GRAY SAND (SP) fine to medium grained
20	
25	End of Boring - 25 feet
	Boring drilled with 4-inch bit to 25 feet. Installed 2-inch PVC well to 23.5 feet. Screened from 3.5 to 23.5 feet. Sand backfill from 3.5 to 23.5 feet.
30	
35	
40	

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LOG OF BORING GW22

French Limited Site
Crosby, Texas

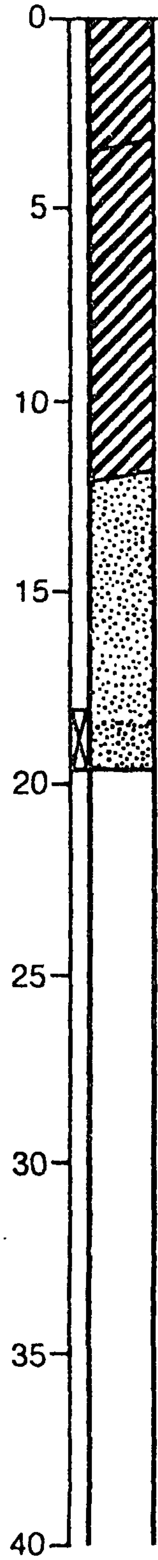
PLATE **B40**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
jm	6013,009.12	MPM	5/84		

Equipment: Rotary Wash

Elevation: 10.7 Date: 4/9/84

Laboratory Tests	Pocket Penetrometer (ksf)	Blows/foot	Moisture Content (%)	Dry Density (pcf)	Depth (ft)	Sample



BROWN AND GRAY CLAY (CH)
stiff, moist

Fill

DARK GRAY CLAY (CH)
stiff, wet

GRAY SAND (SP)
dense, saturated, medium to fine grained

End of Boring - 19.5 feet

Installed 2 inch diameter PVC well to 18 feet. Screened from 13 to 18 feet. Sand backfill from 18 to 5 feet.

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LOG OF BORING GW23

French Limited Site
Crosby, Texas

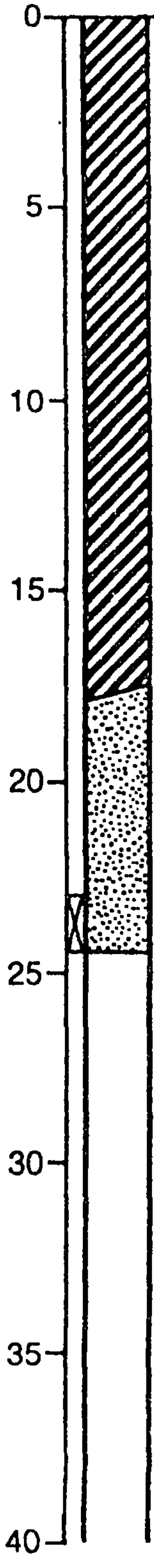
PLATE B41

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
[illegible]	6013,009.12	MPM	5/84		

Laboratory Tests	Pocket Penetrometer (ksf)	Blows/foot	Moisture Content (%)	Dry Density (pcf)	Depth (ft)	Sample

Equipment Rotary Wash

Elevation 7.7 Date 4/9/84



DARK GRAY CLAY (CH)
stiff, saturated

GRAY SAND (SP)
dense, saturated, medium to fine grained

End of Boring - 24.5 feet

Installed 2 inch diameter PVC well to 23 feet. Screened from 18 to 23 feet. Sand backfill from 23 to 13 feet.

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LOG OF BORING GW24

French Limited Site
Crosby, Texas

PLATE B42

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
LM	6013,009.12	MPM	5/84		

Equipment Rotary Wash

Elevation ____ Date 5/15/84

OVA Reading	Pocket Penetrometer (ksf)	Blows/foot	Moisture Content (%)	Dry Density (pcf)	Depth (ft)	Sample	Description
					0		GRAY-BROWN GRAVELLY CLAY (CL) stiff, moist
2.3							GRAY SILTY SAND (SM) loose, saturated, fine grained, occasional strong odor
					5		
10+							
10+					10		
2-3					15		OVA readings up to 250 ppm while reaming occasional black oil color, denser below 15 feet
10+					20		
2-3					25		
							occasional light brown clayey sand
					30		
5					35		
					40		DARK GRAY SILTY SAND (SM) medium dense, saturated, fine grained, occasional strong odor

(Continuation of Log)

OVA Reading	Pocket Penetrometer (ksf)	Blows/foot	Moisture Content (%)	Dry Density (pcf)	Depth (ft)	Sample	Description
					40		
2-4							
					45		
10					50		
<5ppm					55		
							GRAYISH BROWN CLAY (CL) stiff, saturated, vertical laminations, no odor Ream to 58 feet with 10-inch diameter bit. Installed 6-inch PVC casing to 59 feet. Grout annulus with cement/bentonite slurry.
					60		
							RED-BROWN CLAY (CH) very stiff, saturated, some calcareous nodules
					65		
					70		
					75		RED-BROWN AND LIGHT GRAY CLAY (CH) very stiff, saturated, slickensided,
					80		

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LOG OF BORING GW25
French Limited Site
Crosby, Texas

PLATE B43

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
LM	6013,009.12	MPM	5/84		

Laboratory Tests | Pocket Penetrometer (ksf) | Blows/Foot | Moisture Content (%) | Dry Density (pcf) | Depth (ft) | Sample | (Continuation of Log)

80

85

90

occasional silty sand seams below 92 feet

95

BLUE-GRAY CLAY (CH)
stiff, saturated

100

105

110

115

120

Laboratory Tests | Pocket Penetrometer (ksf) | Blows/Foot | Moisture Content (%) | Dry Density (pcf) | Depth (ft) | Sample | (Continuation of Log)

120

LIGHT GRAY AND YELLOW CLAY (CH)
very stiff to hard, saturated,

125

130

135

interbedded clayey sand and sandy clay layers below 138 feet

140

GRAY SILTY SAND (SM)
very dense, saturated, medium grained

145

150

End of Boring - 152 feet

Installed 2-inch diameter PVC well to 150 feet. Screened from 145 to 150 feet. Gravel Pack from 152 to 138.5 feet. Grout from 138.5 to surface using cement/bentonite slurry.

155

160

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LOG OF BORING GW25
French Limited Site
Crosby, Texas

PLATE B4

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
KA	6013,009.12	MPM	5/84		

BOOKMARK

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			SYMBOL	TYPICAL NAMES
COARSE-GRAINED SOILS (MORE THAN HALF IS LARGER THAN #200 SIEVE)	GRAVELS MORE THAN HALF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE SIZE	CLEAN GRAVELS WITH LITTLE OR NO FINES	GW	WELL GRADED GRAVELS, GRAVEL-SAND MIXTURES
			GP	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES
		GRAVELS WITH OVER 12% FINES	GM	SILTY GRAVELS, POORLY GRADED GRAVEL-SAND-SILT MIXTURES
			GC	CLAYEY GRAVELS, POORLY GRADED GRAVEL-SAND-CLAY MIXTURES
	SANDS MORE THAN HALF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE SIZE	CLEAN SANDS WITH LITTLE OR NO FINES	SW	WELL GRADED SANDS, GRAVELLY SANDS
			SP	POORLY GRADED SANDS, GRAVELLY SANDS
		SANDS WITH OVER 12% FINES	SM	SILTY SANDS, POORLY GRADED SAND-SILT MIXTURES
			SC	CLAYEY SANDS, POORLY GRADED SAND-CLAY MIXTURES
FINE-GRAINED SOILS (MORE THAN HALF IS SMALLER THAN #200 SIEVE)	SILTS AND CLAYS LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS, OR CLAYEY SILTS WITH SLIGHT PLASTICITY
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
			OL	ORGANIC CLAYS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACIOUS FINE SANDY OR SILTY SOILS, ELASTIC SILTS
			CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS			Pt	PEAT AND OTHER HIGHLY ORGANIC SOILS

KEY TO TEST DATA

— "Undisturbed" Sample	SA — Sieve Analysis
— Standard Penetration Test Sample	MA — Sieve Analysis w Hydrometer
LL — Liquid Limit (in %)	PERM — Permeability
PL — Plastic Limit (in %)	PID — Photo Ionization Detector (ppm)
PI — Plasticity Index (in %)	Blows/foot — refers to SPT "N" value
SG — Specific Gravity	Remold — Sample remolded prior to testing
#-200 — % Fines passing #200 sieve	

NOTES

These Notes Are Applicable To All Boring and/or Test Pit Log Plates in This Report.

1. Elevations refer to Mean Sea Level Datum (1963)
2. Undisturbed Samples consisted of hydralically pushed 3-inch diameter Shelby Tubes and driven 3-inch OD x 2.5-inch ID Split Spoon Samplers. A 140 lb. hammer falling 30-inches was used to drive the Split Spoon Sampler. Blow counts were converted to SPT "N" valves by multiplying by 0.56.
3. Standard Penetration Test is the number of blows required to drive a 2-inch OD by 1.3 inch ID Split Spoon Sampler 12-inches using a 140-lb. hammer falling 30 inches.
4. Borings were drilled with a 4-inch diameter fishtail bit.

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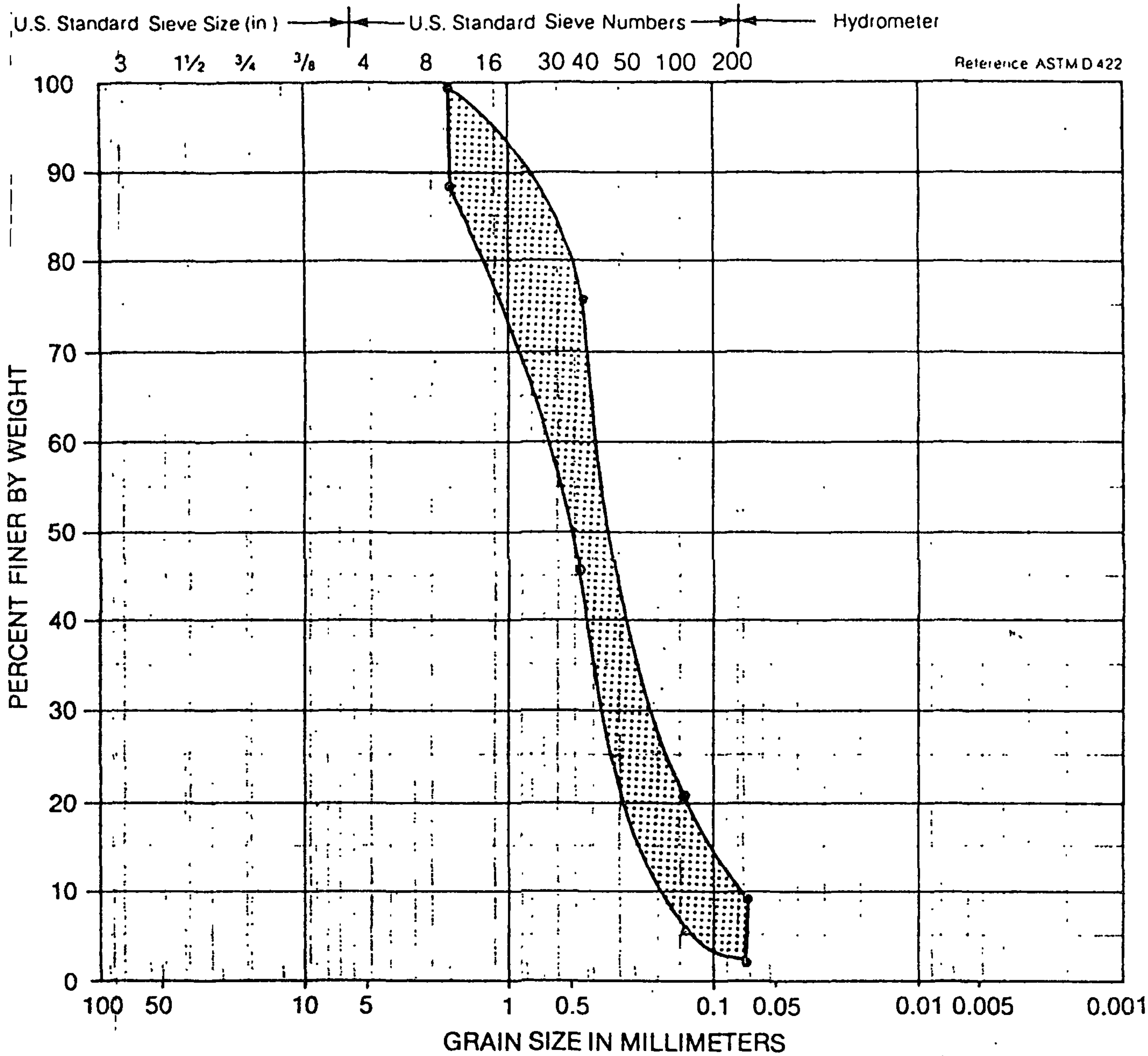
SOIL CLASSIFICATION CHART AND KEY TO TEST DATA
French Limited Site

PLATE C1

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
LM	6013.009.12	MPM	5/84		



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

Symbol	Sample Source	Classification
	Summary	Range For Clean Sand (SP)

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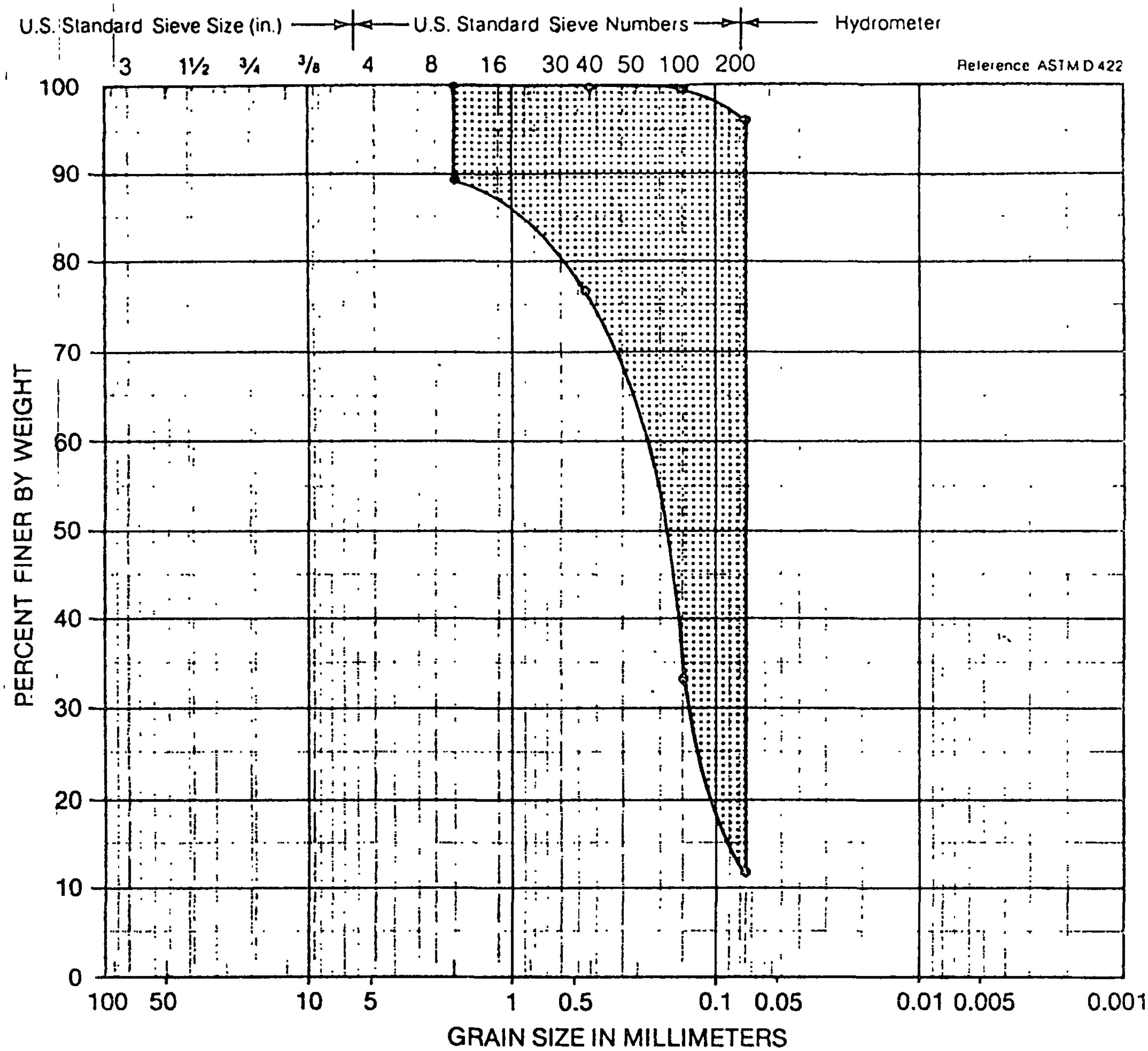
Particle Size Analysis
French Limited Site
Crosby, Texas

PLATE
C2

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
LM	6013,009.12	MPM	5/84		



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

Symbol	Sample Source	Classification
	Summary	Range For Silty Sands (SM) and Sandy Silts (ML)

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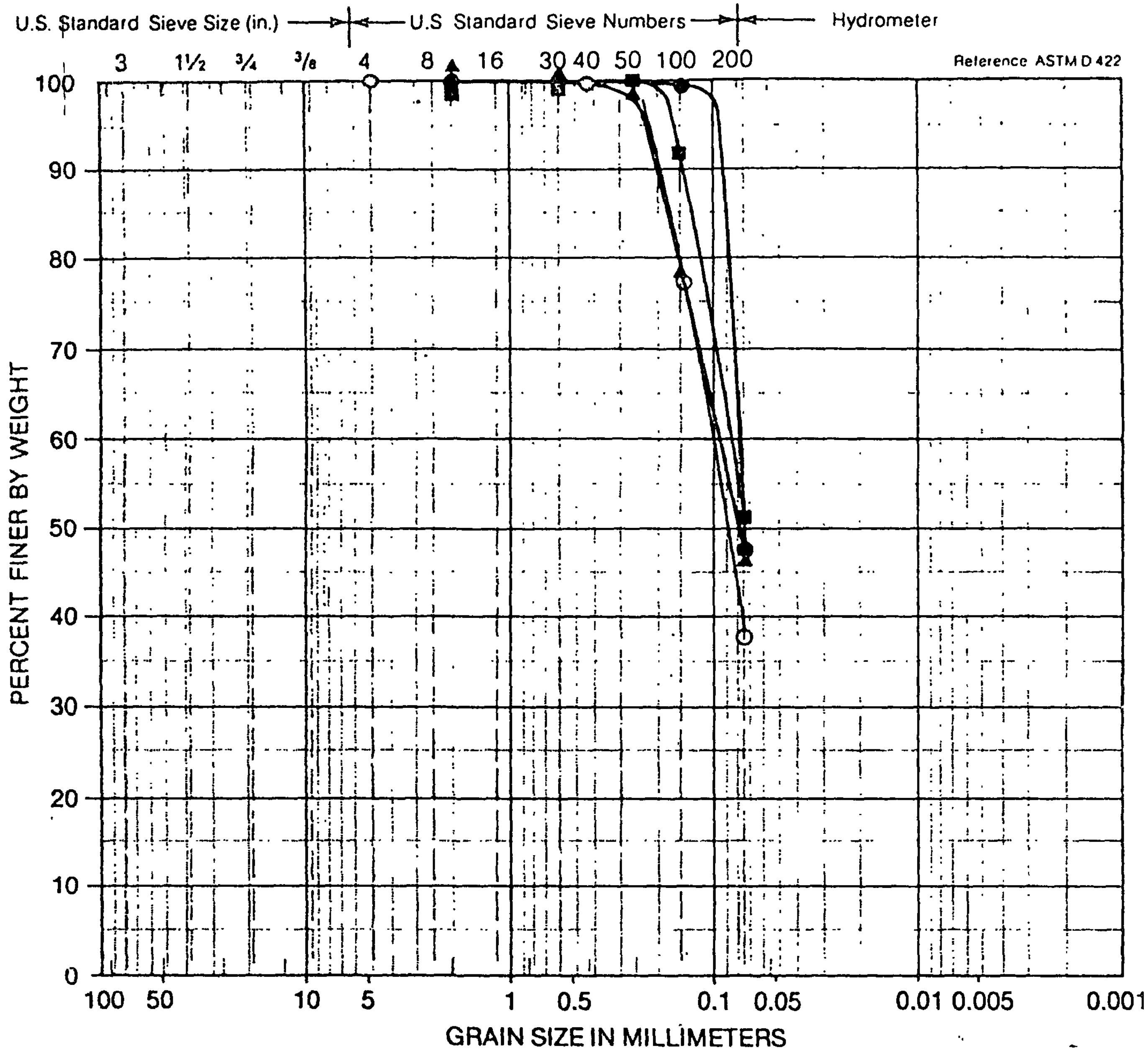
PLATE
C3

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HM	6013,009.12	MPM	5/84		



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

Symbol	Sample Source	Classification
●	B1/GW1 at 8.5'	SILTY SAND (SM)
▲	B2/GW2 at 13.0'	SILTY SAND (SM)
■	B2/GW2 at 48.0'	SANDY SILT (ML)
○	B2/GW2 at 53.0'	SILTY SAND (SM)

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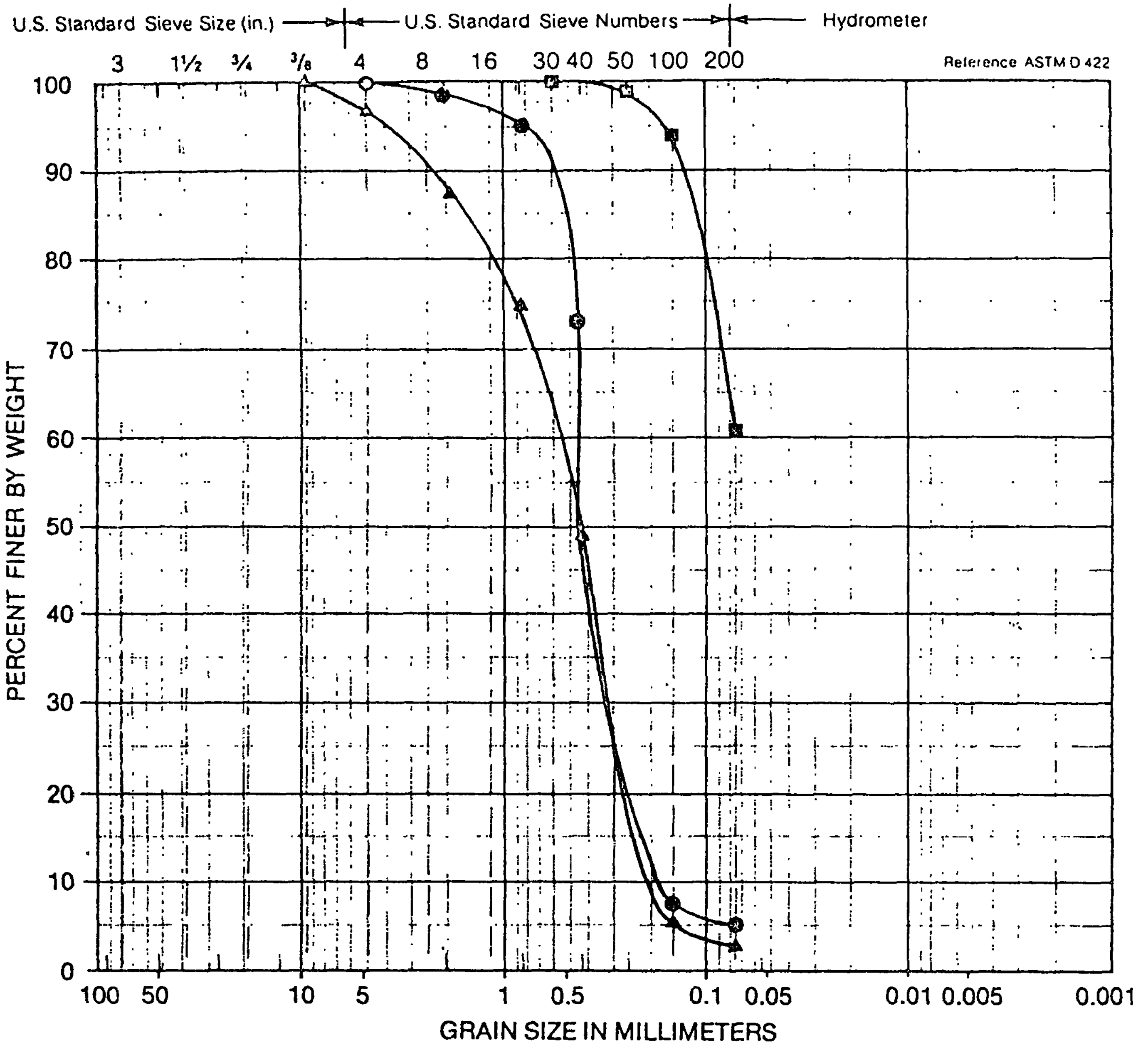
Crosby, Texas

PLATE
C4

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
JAP	6013,009.12	MPM	5/84		



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

Symbol	Sample Source	Classification
●	B3/GW3 at 8.0'	SAND (SP)
▲	B3/GW3 at 23.0'	SAND (SP)
■	B3/GW3 at 38.0'	SANDY SILT (ML)

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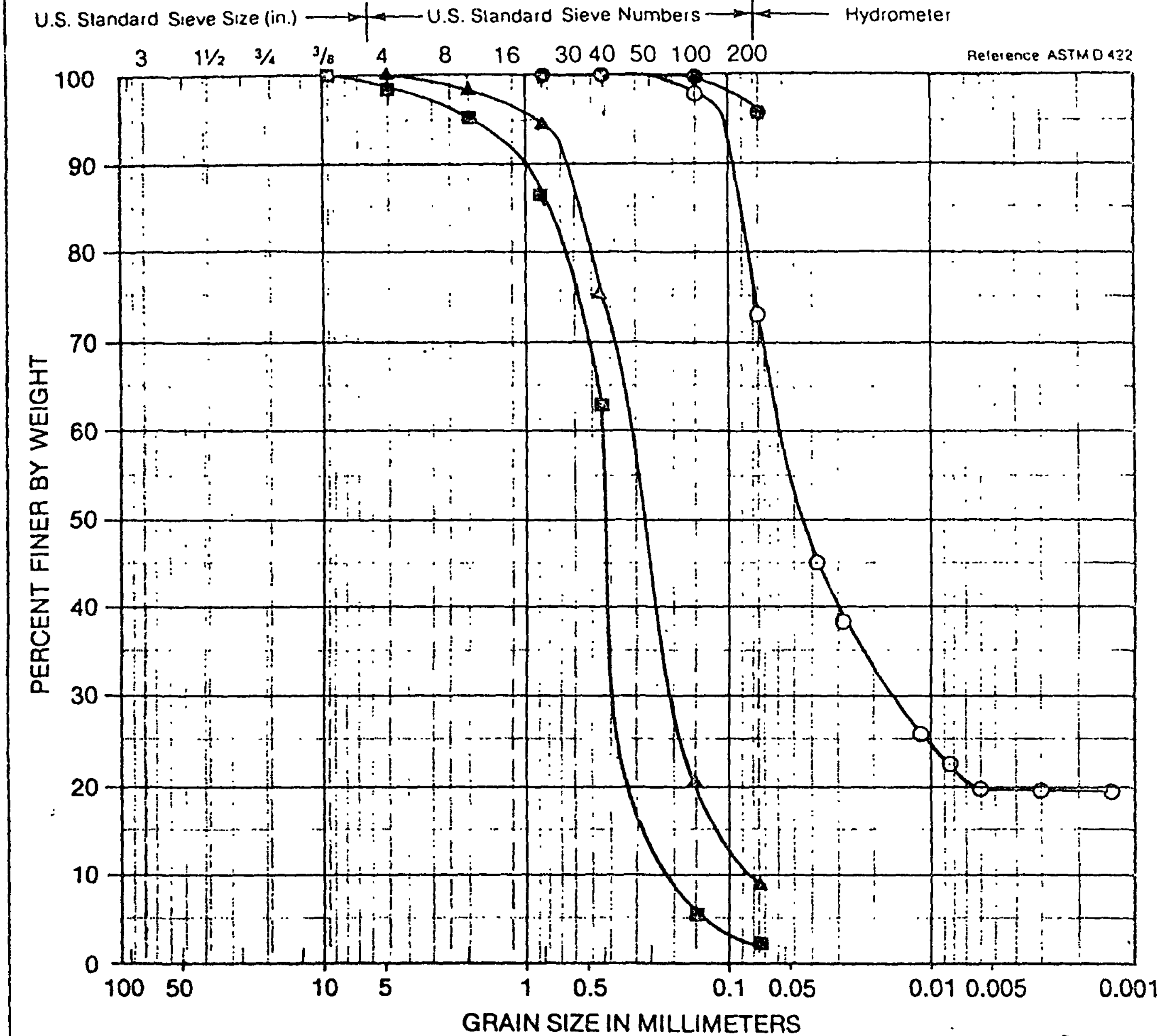
PLATE
C5

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
JAP	6013,009.12	MPM	5/84		



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

Symbol	Sample Source	Classification
●	B4/GW4 at 33.0'	SILTY CLAY (CL)
▲	B5/GW5 at 3.0'	SAND (SP-SM)
■	B5/GW5 at 18.0'	SAND (SP)
○	B5/GW5 at 28'	SANDY CLAY (CL)

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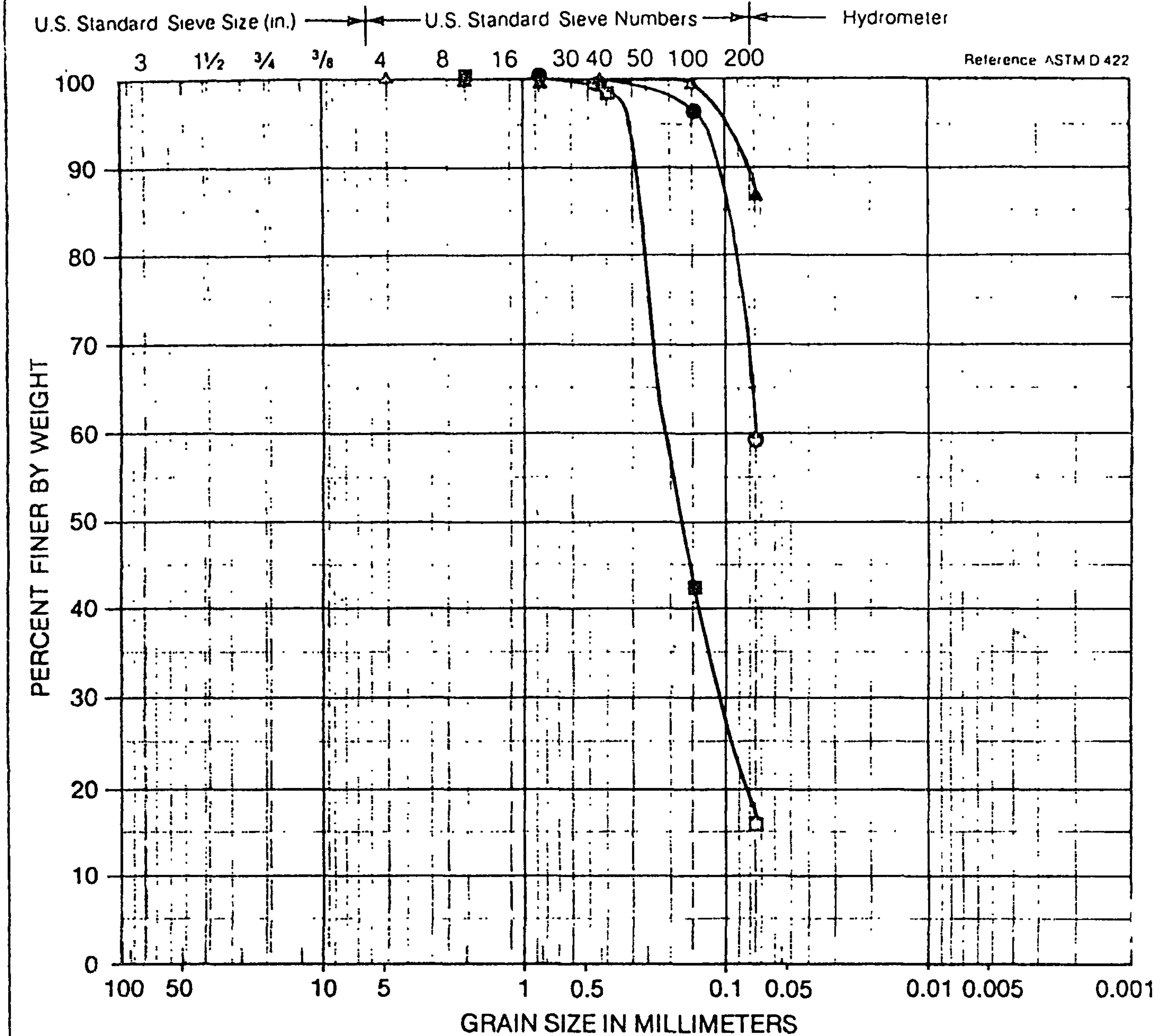
PLATE
C6

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
JAP	6013,009.12	MPM	5/84		



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

Symbol	Sample Source	Classification
●	B6/GW6 at 44.0'	SANDY SILT (ML)
▲	B6/GW6 at 94.0'	SANDY SILT (ML)
■	B6/GW6 at 143.0'	SILTY SAND (SM)

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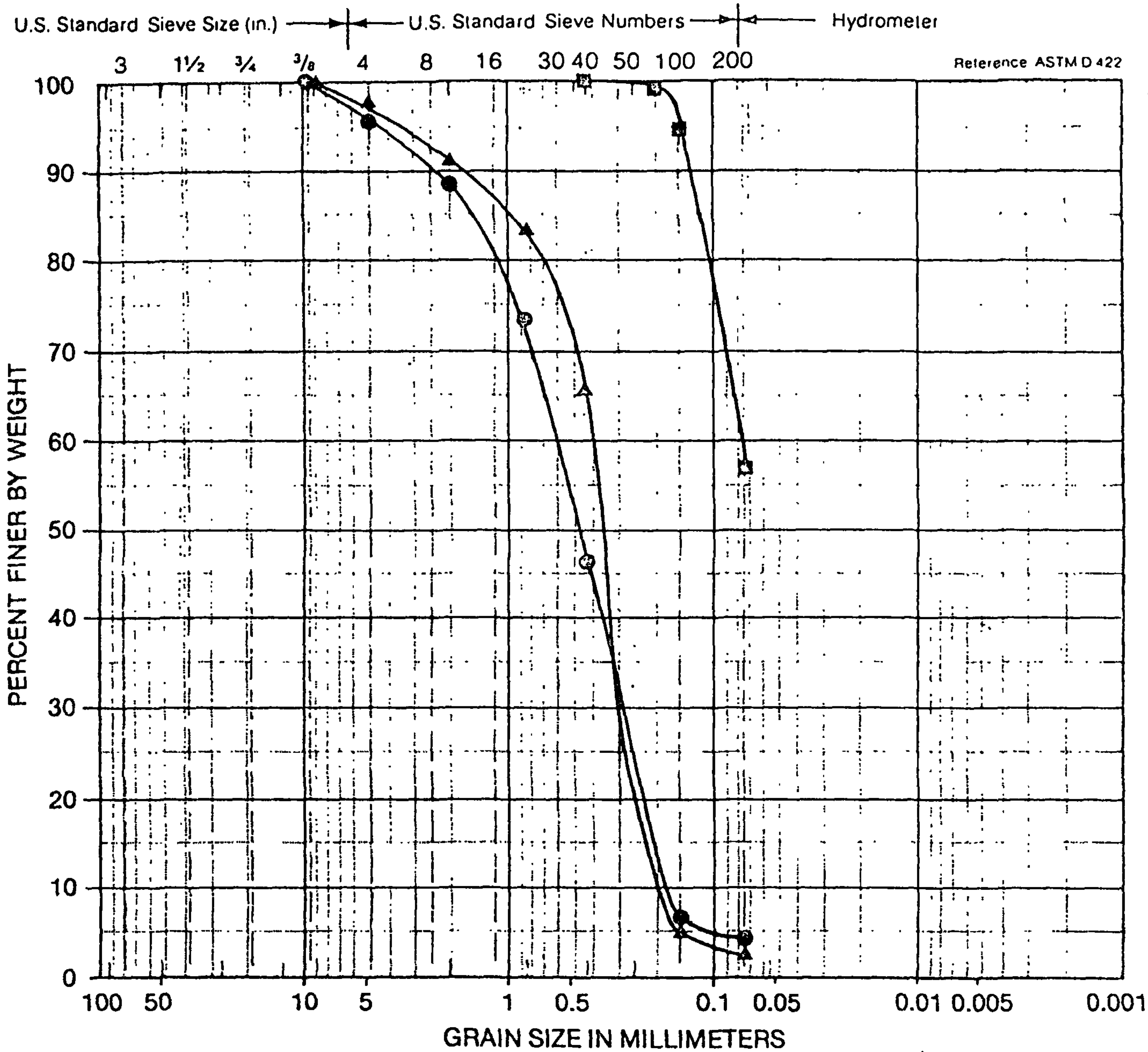
PLATE
C7

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
JAP	6013,009.12	MPM	5/84		



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

Symbol	Sample Source	Classification
●	B7 at 18.0'	SAND (SP)
▲	B7 at 28.0'	SAND (SP)
■	B7 at 43.0'	SANDY CLAY (CL)

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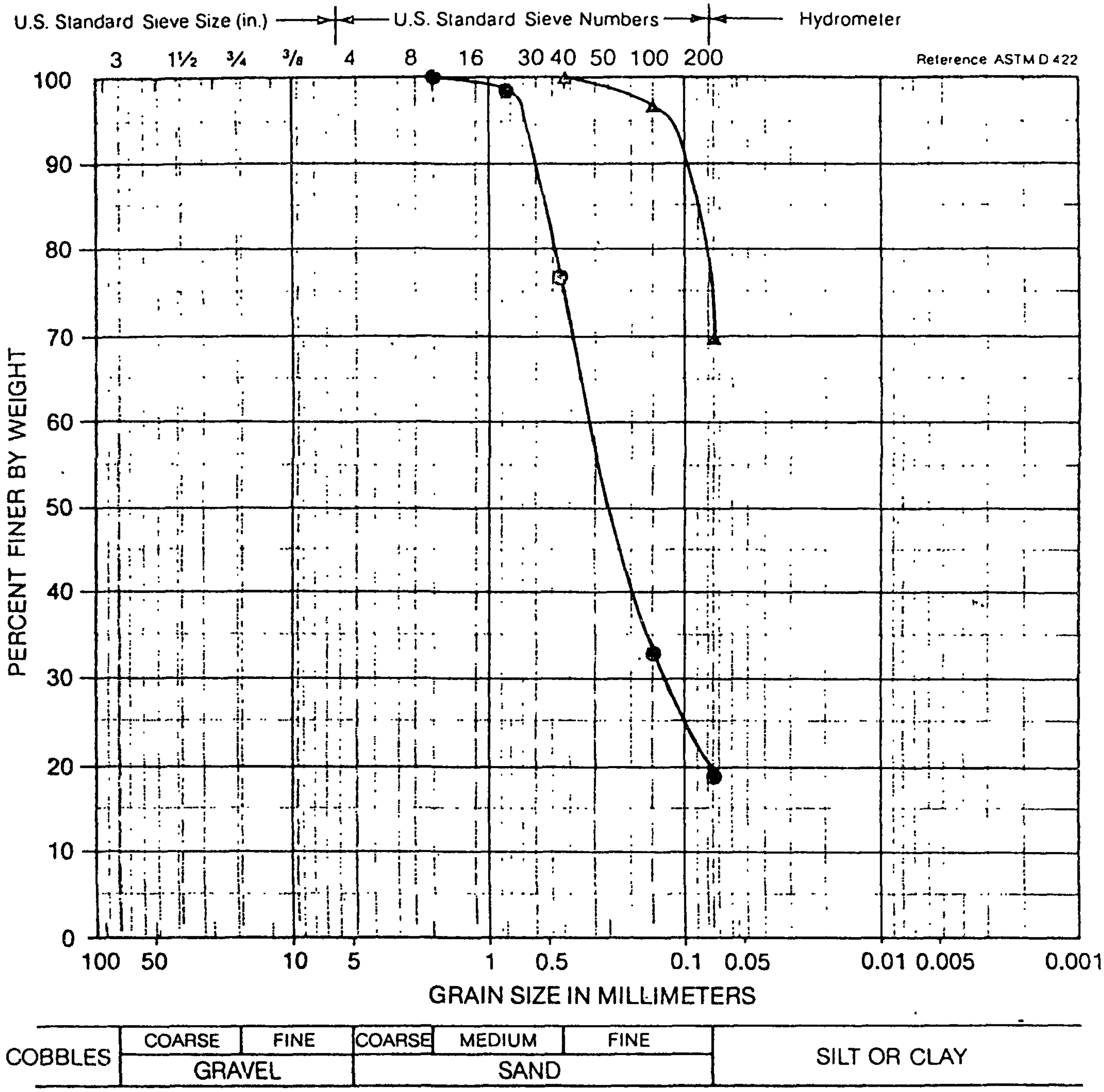
PLATE
C8

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
JAP	6013,009.12	MPM	5/8f		



Symbol	Sample Source	Classification
●	B8 at 8.0'	SILTY SAND (SM)
▲	B8 at 33.0'	SANDY SILT (ML)

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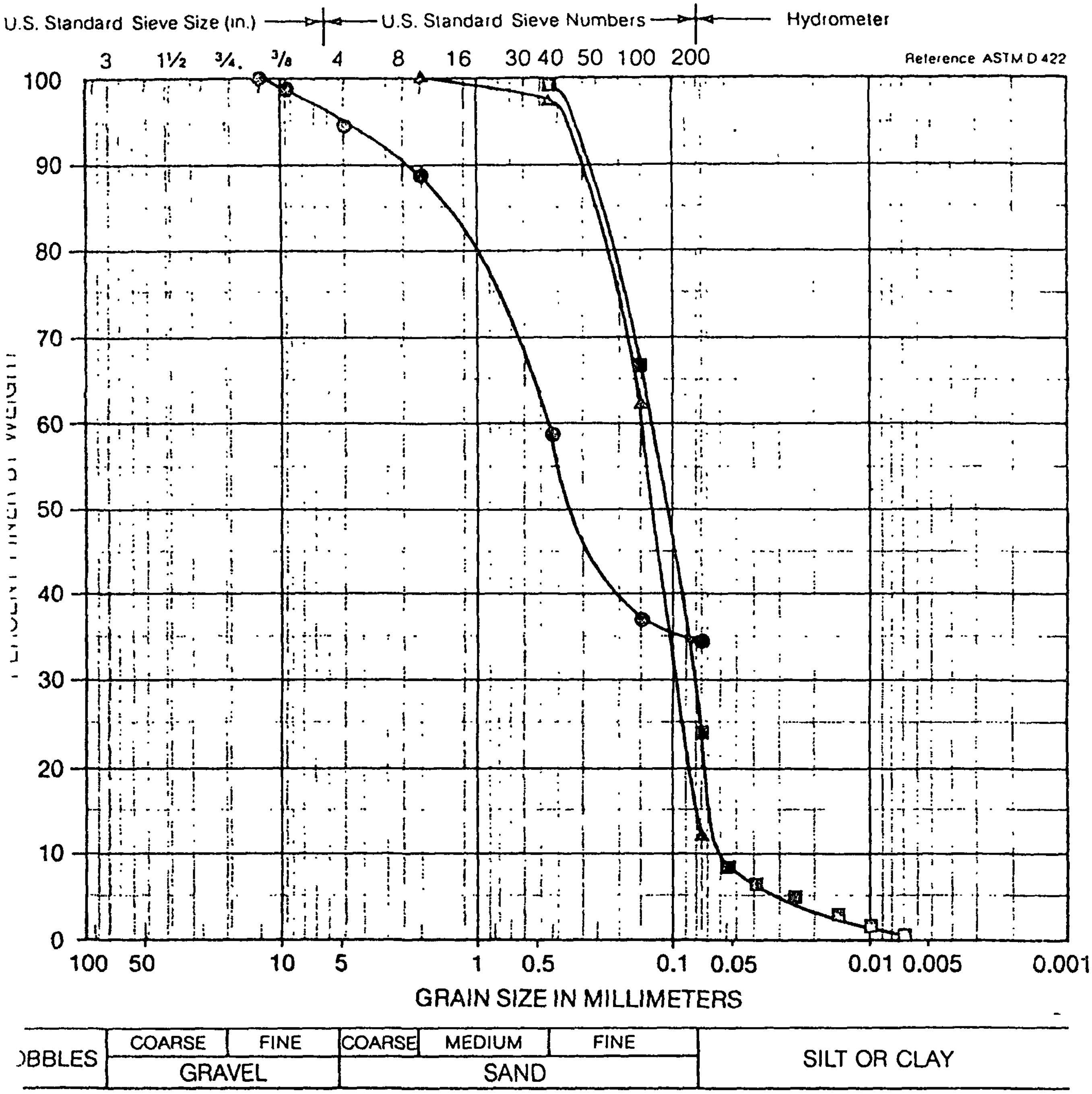
PLATE
C9

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
JAP	6013,009.12	MPM	5/84		



Symbol	Sample Source	Classification
■	B9 at 13.0'	SILTY SAND (SM)
●	B9 at 23.0'	SILTY SAND (SM)
▲	B9 at 38.0'	SILTY SAND (SM)

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French Limited Site
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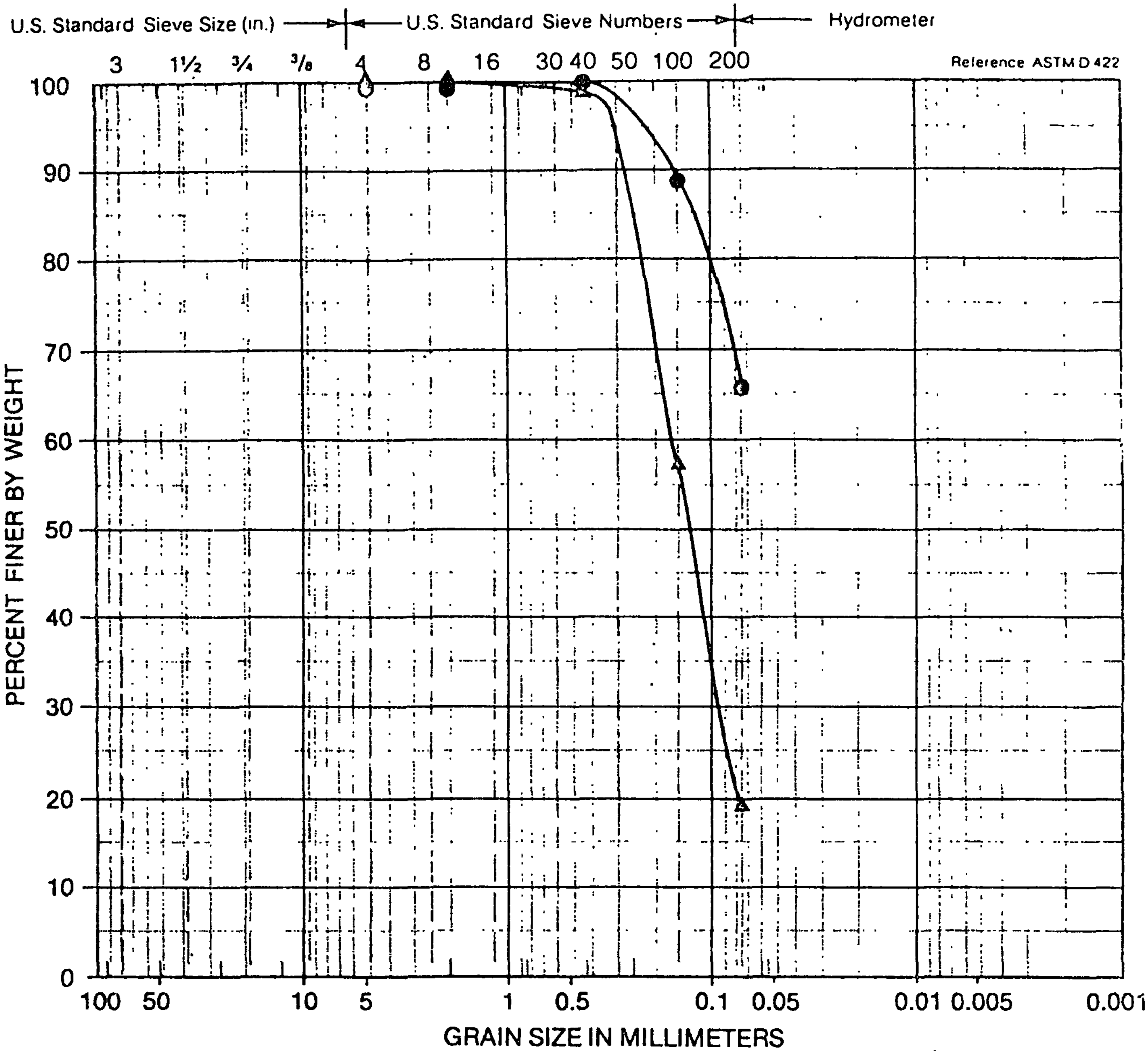
PLATE
C 10

JOB NUMBER	APPROVED	DATE	REVISED	DATE
6013,009.12	MPM	5/84		



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

Symbol	Sample Source	Classification
●	B10 at 8.0'	SANDY SILT (ML)
▲	B10 at 18.0'	SILTY SAND (SM)

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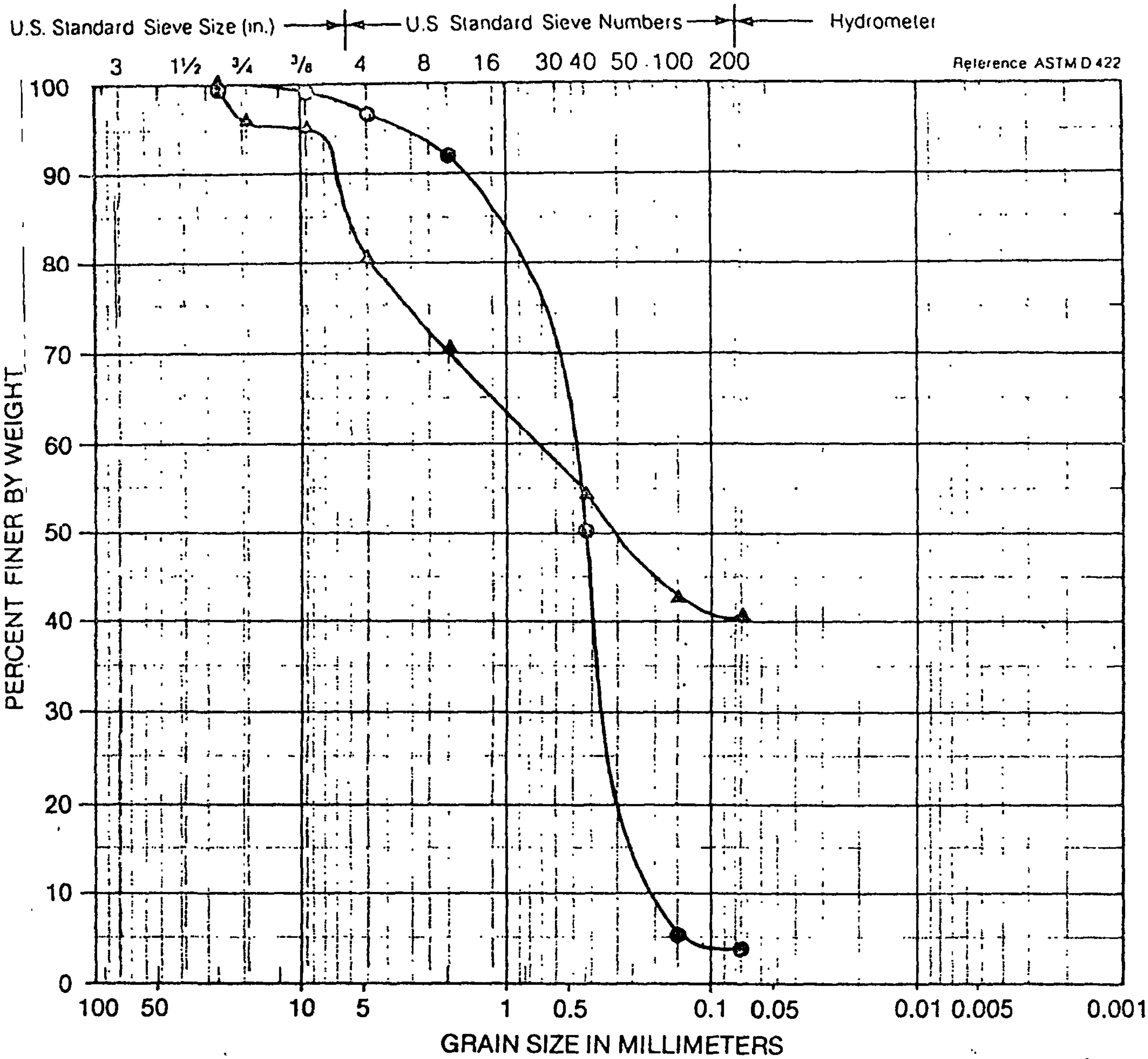
PLATE
C11

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
JAP	6013.009.12	MPM	5/84		



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

Symbol	Sample Source	Classification
●	B11 at 13.0'	SAND (SP)
▲	B11 at 28.0'	GRAVELLY SILTY SAND (SM)

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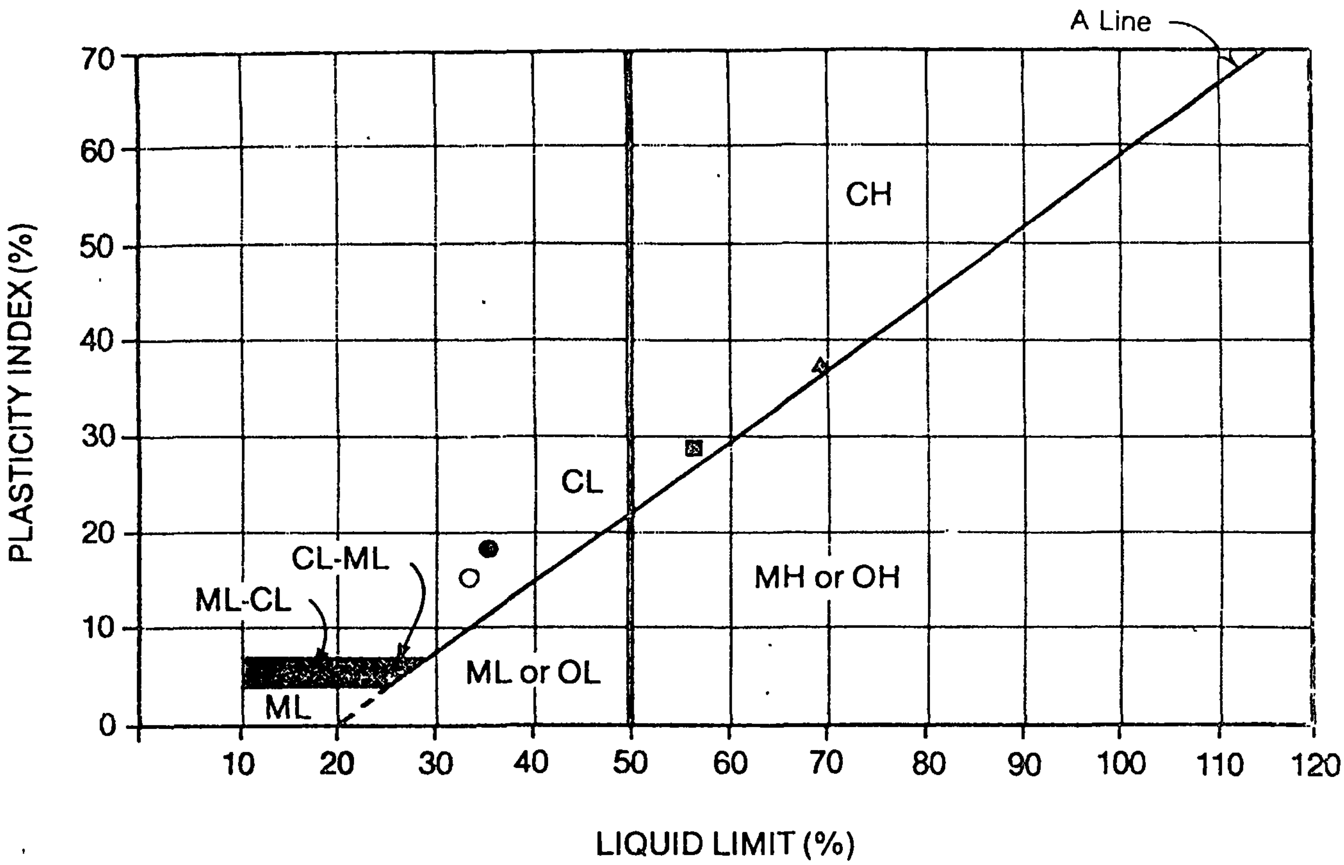
PLATE
C12

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
AP	6013,009.12	MPM	5/84		

Reference ASTM D 423, 424



Symbol	Source	Classification	Natural M.C. (%)	Liquid Limit (%)	Plasticity Index (%)	% Passing #200 Sieve
●	B2 at 23.0'	SILTY CLAY (CL)	14.5	35	18	-
▲	B2 at 33.0'	CLAY (CH)	24.1	69	37	-
■	B2 at 58.0'	CLAY (CH)	21.6	56	29	-
○	B4 at 28.0'	SANDY CLAY (CL)	16.8	33	16	

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Plasticity Chart
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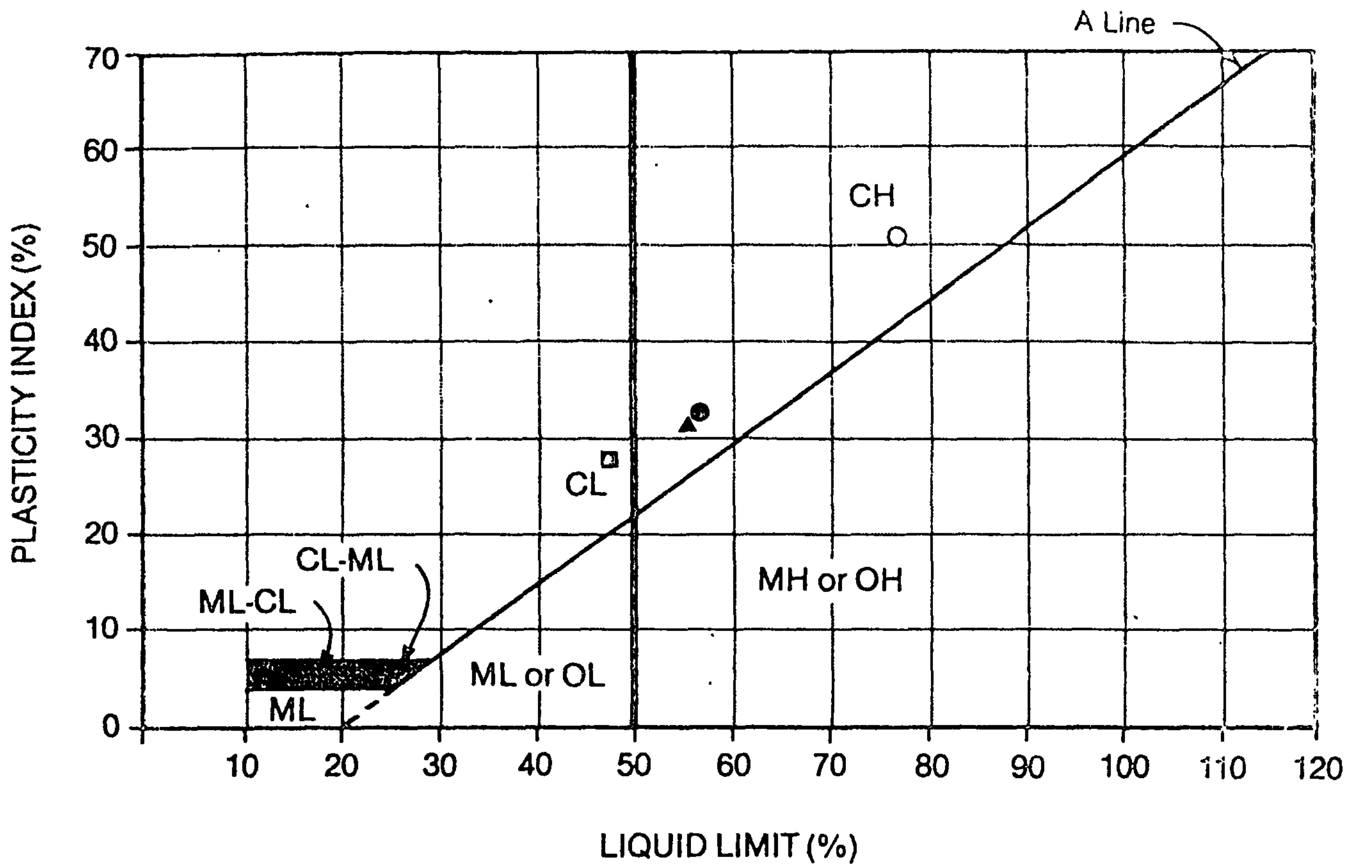
PLATE
C13

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
JAP	6013,009.12	MPM	5/84		

Reference ASTM D 423, 424



Symbol	Source	Classification	Natural M.C. (%)	Liquid Limit (%)	Plasticity Index (%)	% Passing #200 Sieve
●	B6 at 48.0'	CLAY (CH)	27.9	56	32	-
▲	B6 at 73.0'	CLAY (CH)	23.0	55	31	-
■	B6 at 103.0'	CLAY (CL)	30.2	48	28	-
○	B7 at 48.0'	CLAY (CH)	33.2	76	51	

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Plasticity Chart
French Limited Site
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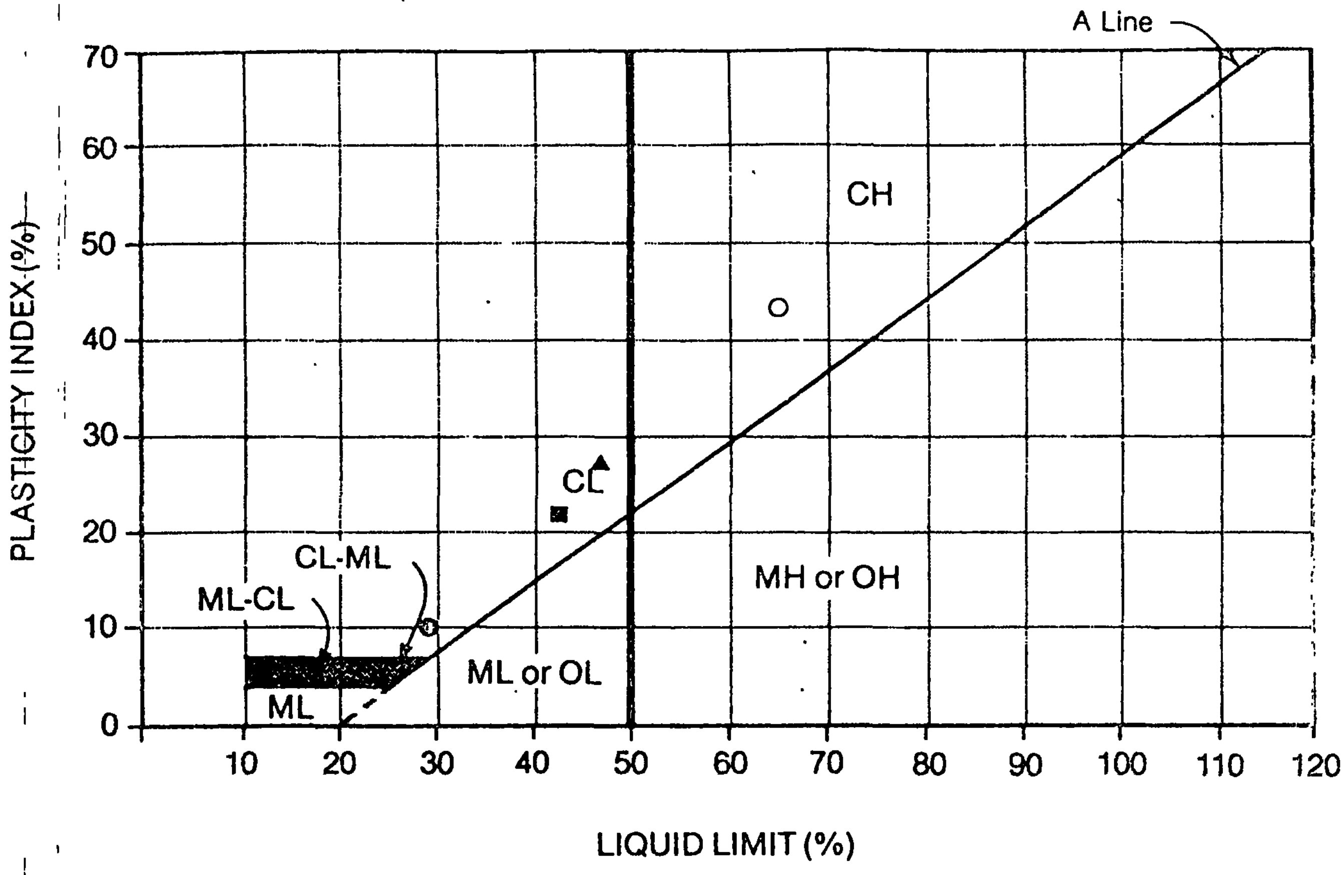
PLATE
C14

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
JAP	6013,009.12	MPM	5/84		

Reference ASTM D 423, 424



Symbol	Source	Classification	Natural M.C. (%)	Liquid Limit (%)	Plasticity Index (%)	% Passing #200 Sieve
●	B8 at 43.0'	CLAY (CL)	17.5	29	10	
▲	B9 at 0'	SILTY CLAY (CL)	23.7	46	27	
■	B9 at 57.0'	CLAY (CL)	32.2	42	22	
○	B10 at 28.0'	CLAY (CH)	30.6	65	43	

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Plasticity Chart
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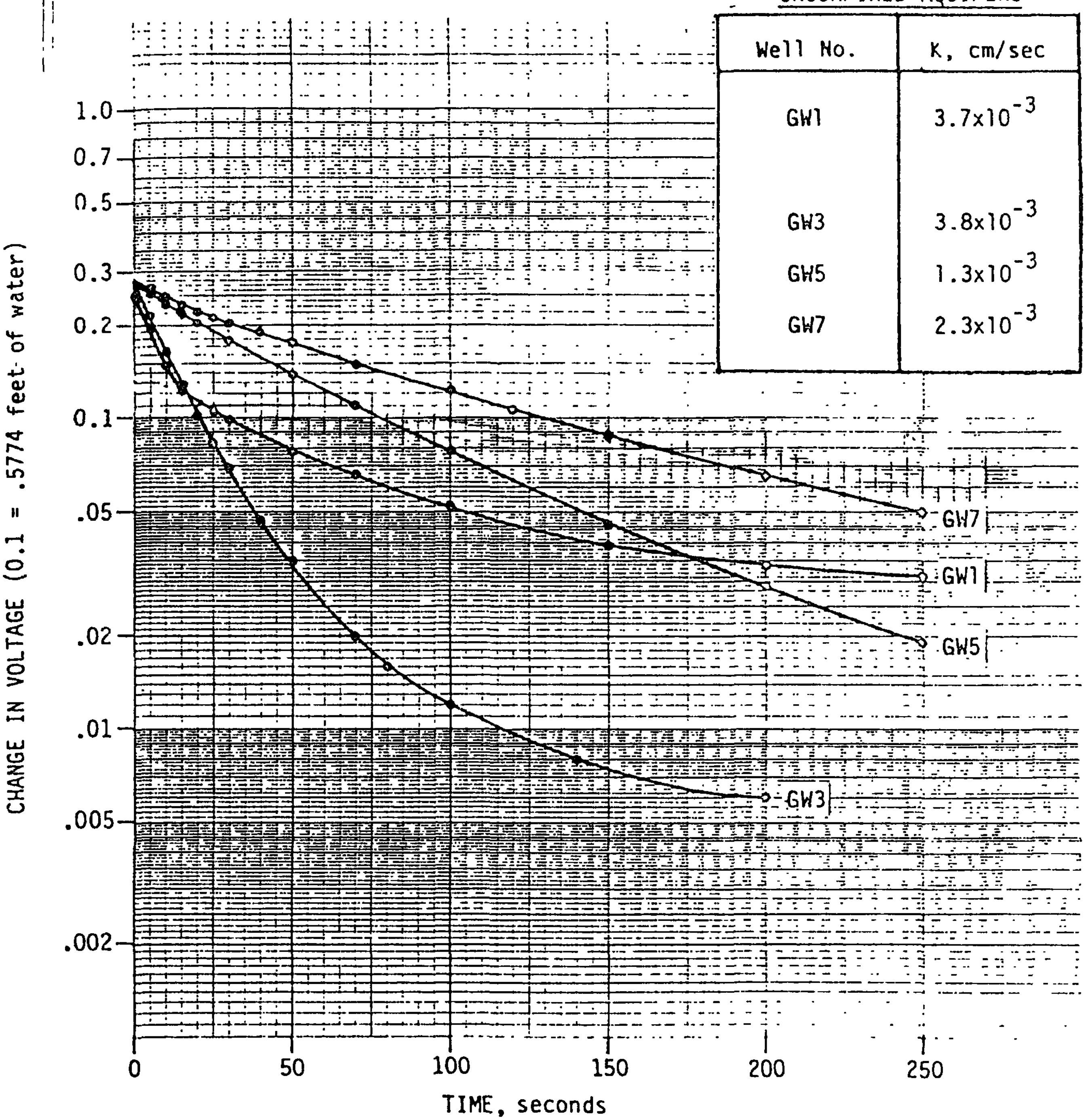
Crosby, Texas

PLATE
C15

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
AP	6013,009.12	MPM	5/84		

BOOKMARK



UNCONFINED AQUIFERS

Well No.	K, cm/sec
GW1	3.7×10^{-3}
GW3	3.8×10^{-3}
GW5	1.3×10^{-3}
GW7	2.3×10^{-3}

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SLUG TEST DATA

French Limited Site
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PLATE D1

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HM	6013,009.12	MPM	5/84		

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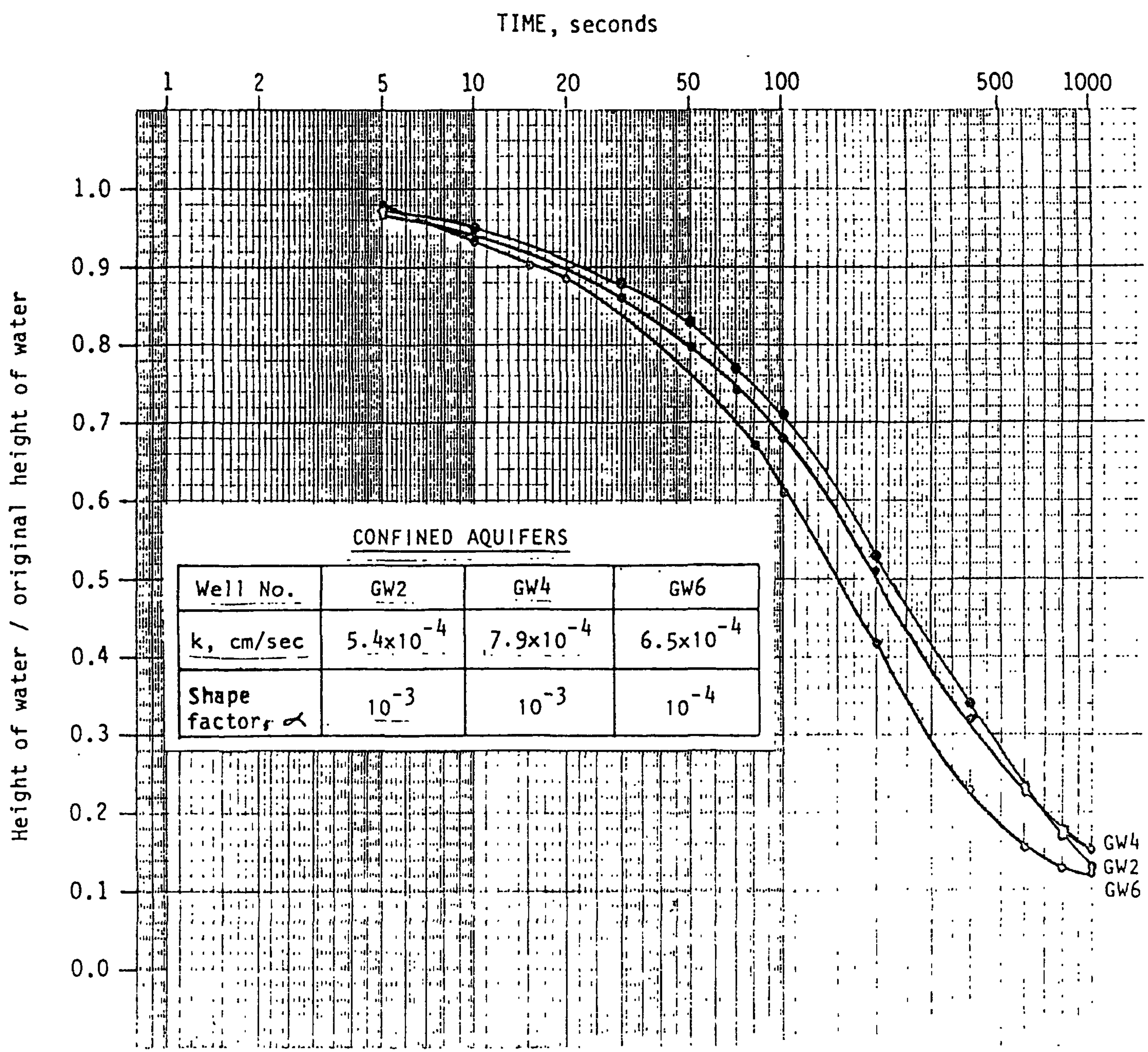
SLUG TEST DATA

French Limited Site
Crosby, Texas

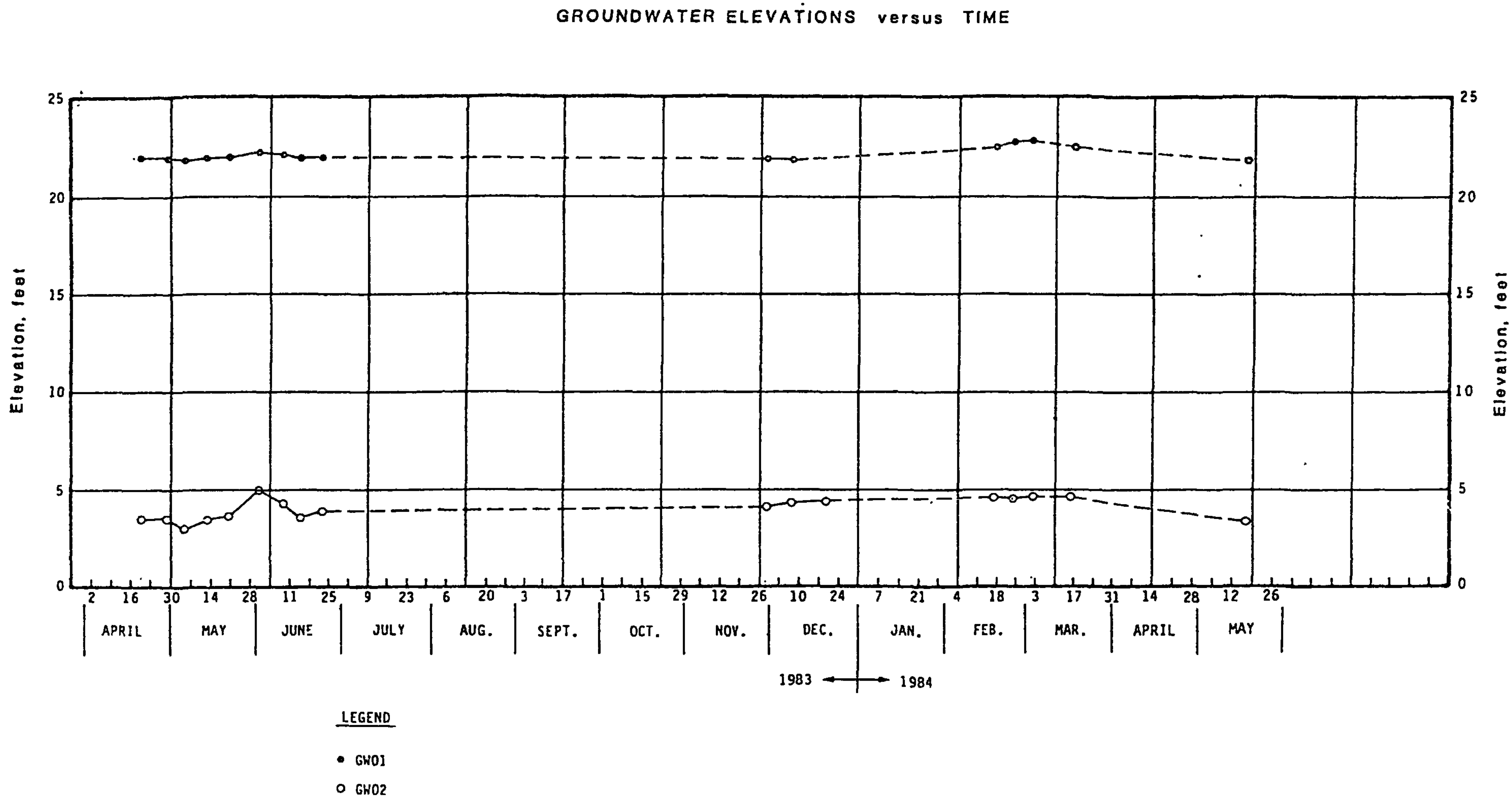
DRAWN: JM
JOB NUMBER: 6013,009.12
APPROVED: MPM
DATE: 5/84
REVISED:
DATE:

PLATE D2



CONFINED AQUIFERS

Well No.	GW2	GW4	GW6
k, cm/sec	5.4×10^{-4}	7.9×10^{-4}	6.5×10^{-4}
Shape factor, α	10^{-3}	10^{-3}	10^{-4}



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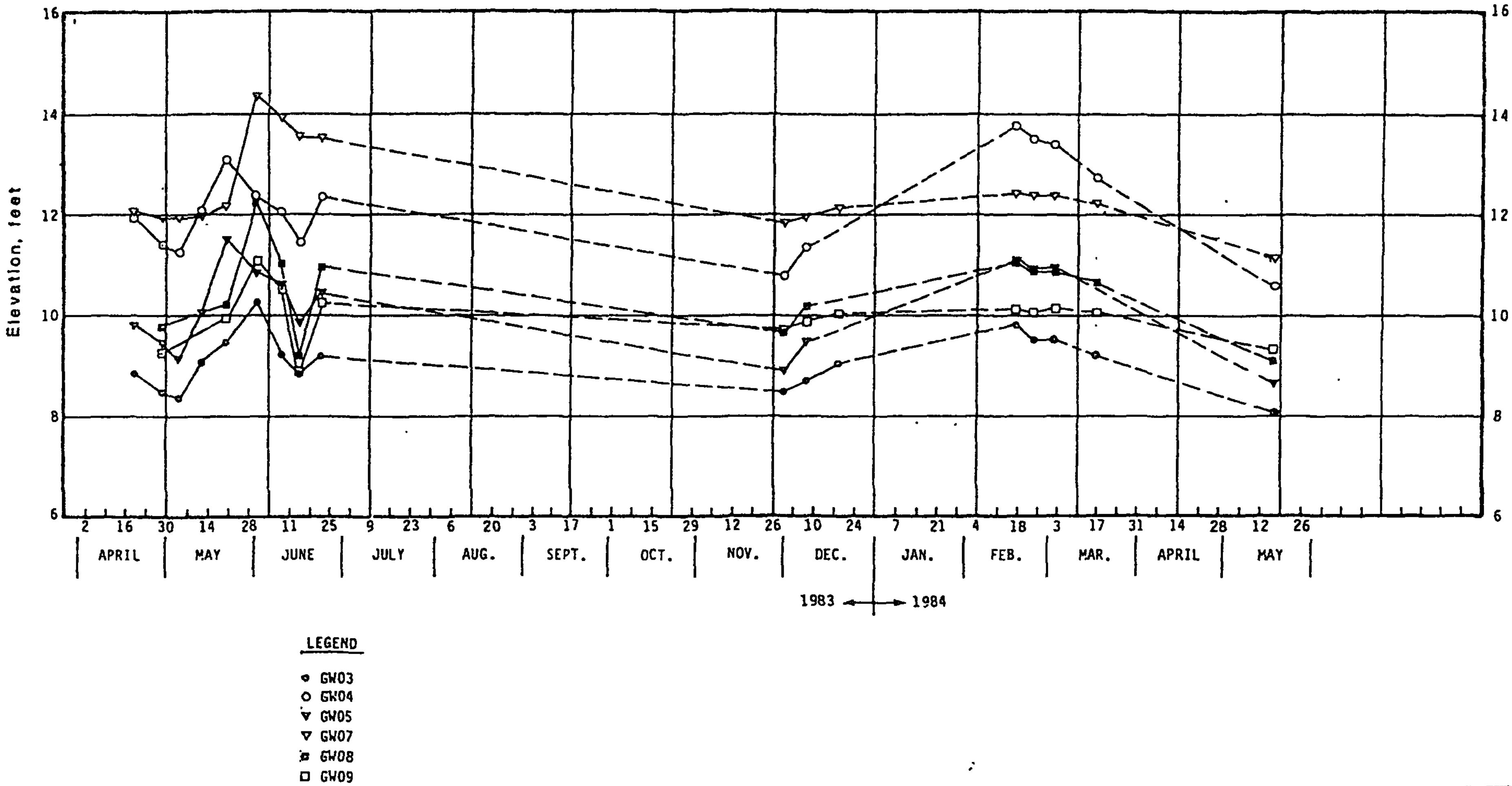
GROUNDWATER HYDROGRAPH
French Limited Site
Crosby, Texas

PLATE E1

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
KM	6013,009.12	MPM	5/84		

GROUNDWATER ELEVATIONS versus TIME



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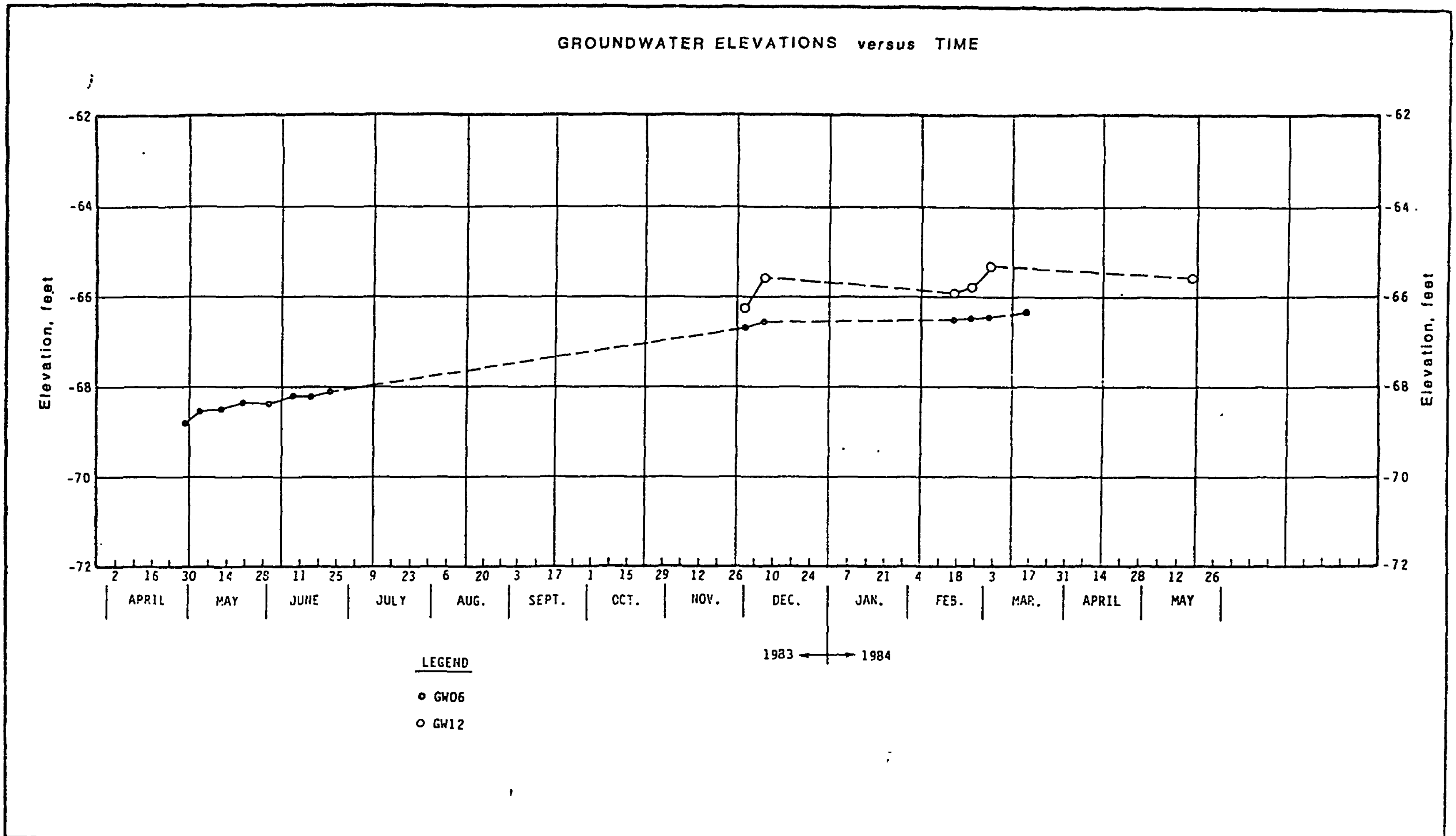
GROUNDWATER HYDROGRAPH
French Limited Site
Crosby, Texas

PLATE E2

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
LM	6013,009.12	MPM	5/84		



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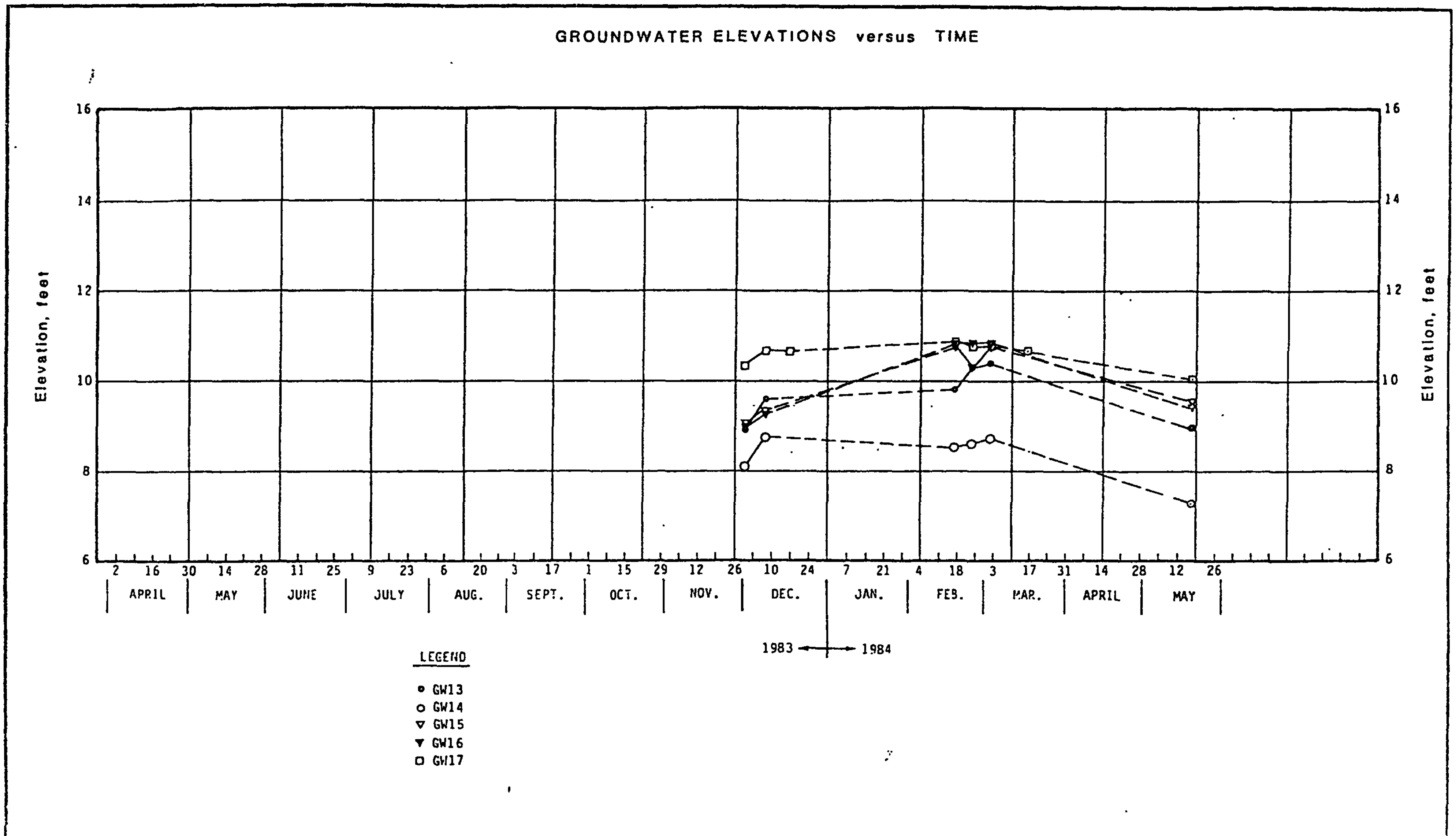
GROUNDWATER HYDROGRAPH
French Limited Site
Crosby, Texas

PLATE E3

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
LM	6013,009.12	MPM	5/84		



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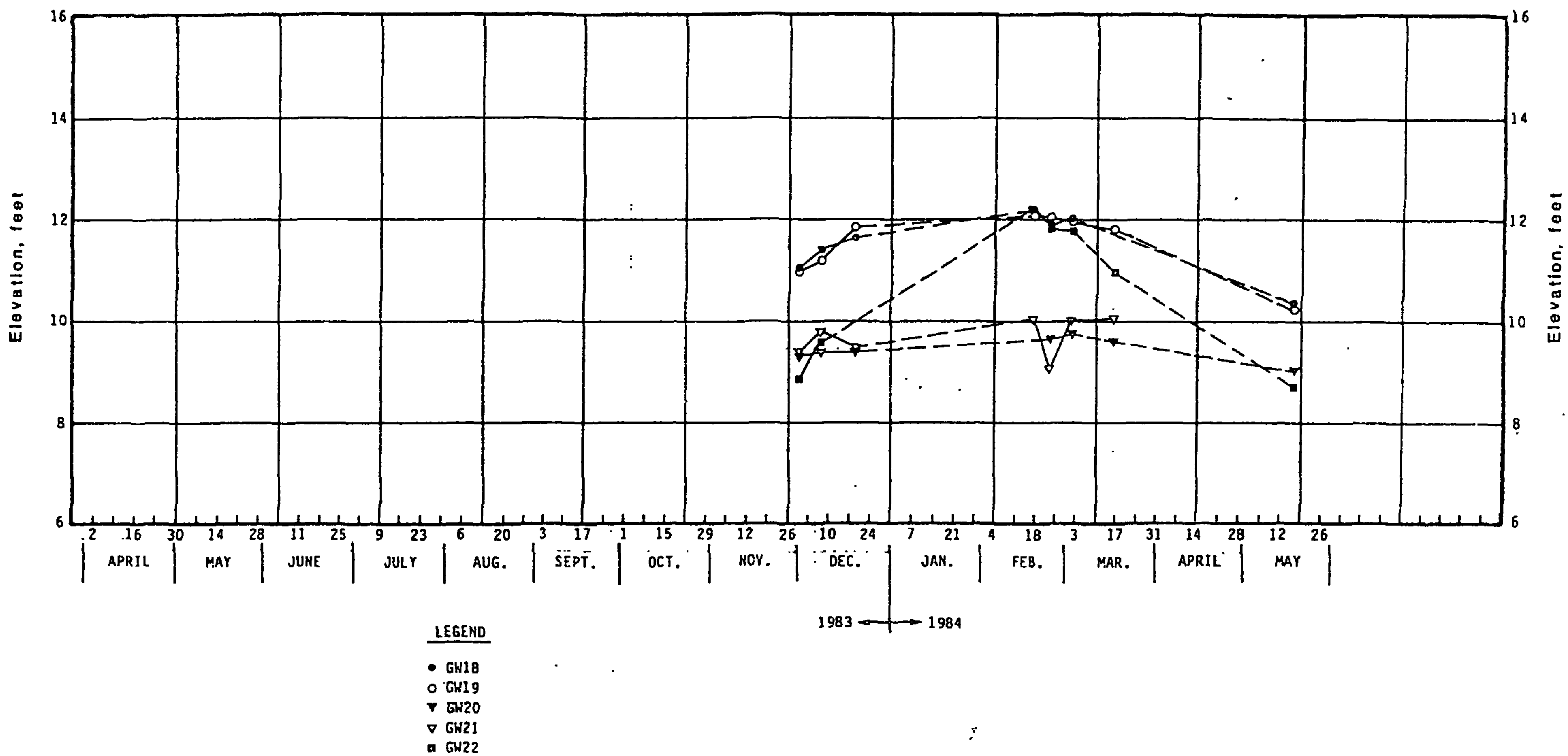
GROUNDWATER HYDROGRAPH
French Limited Site
Crosby, Texas

PLATE E4

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
bm	6013,009.12	MPM	5/84		

GROUNDWATER ELEVATIONS versus TIME



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GROUNDWATER HYDROGRAPH
French Limited Site
Crosby, Texas

PLATE
F5

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
LM	6013,009.12	MPM	5/84		

Table F-1. Water Quality Criteria

References	1	2, 3, 4, 5	2, 3	
			Freshwater Aquatic Life (ug/l)	
Parameter	Maximum Drinking Water Contaminant Level (ug/l)	Human Health Criteria (ug/l)	Maximum or Acute Toxicity	24 Hour Average or Chronic Toxicity
Metals				
Beryllium	--	0.068	130	5.3
Cadmium	10	10	3.6†	0.025
Chromium (Total)	50	50*	--	--
Copper	1,000	--	22†	5.6
Lead	50	50*	170†	3.8†
Mercury	2.0	0.144	4.1	0.20
Nickel	--	13.4	1,800†	96
Thallium	--	13	1,400	40
Zinc	5,000	--	320†	47
GC/MS Volatiles				
Benzene	--	6.6	5,300	--
Chloroform	100**	1.9	28,900	1,240
Chlorobenzene	--	488*	250††	--
1,1-Dichloroethane	--	--	--	--
1,2-Dichloroethane	--	9.4	118,000	20,000
T-1,2-Dichloroethane	--	--	--	--
1,2-Dichloropropane	--	--	23,000†††	5,700†††
T-1,3-Dichloropropene	--	87	6,060****	244****
Ethylbenzene	--	1,400*	32,000	--
1,1,2,2-Tetrachloroethane	--	1.7	9,320	2,400
1,1,2-Trichloroethane	--	6.0	18,000	9,400
Trichloroethene	--	27	45,000	--
Toluene	--	14,300*	17,500	--
Vinyl Chloride	--	20	--	--
GC/MS Acid				
Phenol	--	3,500	10,200	2,560
GC/MS Base/Neutral				
Acenaphthylene	--	0.028***	--	--
bis(2-ethylhexyl)phthalate	--	15,000	940	3.0
1,4-Dichlorobenzene	--	400††††	1,120††††	768††††
1,2-Dichlorobenzene	--	400††††	1,120††††	768††††
Dioctylphthalate	--	--	940*****	3****
Fluoranthene	--	42	3,980	--
Acenapthene	--	--	1,700	--
Anthracene	--	0.028***	--	--
Benzo(A)anthracene	--	0.028***	--	--
Benzo(B)fluoranthene	--	0.028***	--	--
Benzo(A)pyrene	--	0.028***	--	--
Chrysene	--	0.028***	--	--
Di-N-butyl phthalate	--	34,000	940*****	3*****
Fluorene	--	0.028***	--	--
Naphthalene	--	--	2,300	620
Phenanthrene	--	0.028***	--	--
Pyrene	--	0.028***	--	--
PCBs, Pesticides				
PCBs	--	0.00079	2.0	0.014

* Based on toxicity rather than 10^{-5} cancer risk factor.
† Hardness dependent.
** Total trihalomethanes.
†† For chlorinated benzenes as a class.
*** For polynuclear aromatics as a class.
††† For dichloropropane as a class.
**** For dichloropropene as a class.
†††† For dichlorobenzene as a class.
***** For phthalate esters as a class.

[1] USEPA. 1981. National Interim Primary Drinking Water Regulations CFR 40 Part 141 and National Secondary Drinking Water Regulations CFR 40 Part 143.

[2] Ambient Water Quality Criteria for Acenaphthene Through Zinc. Office of Water Regulations and Standards. USEPA. Washington, D.C.

[3] Quality Criteria for Water. 1976. Office of Water and Hazardous Materials. USEPA. Washington, D.C. (Redbook)

[4] USEPA. 1980. Water Quality Criteria Documents: Availability. Federal Register, 45(231):79318-79379.

[5] Federal Register. August 13, 1981. Correction Notice p. 40919.

BOOKMARK

APPENDIX G

Chemical Analysis Methods

Samples were analyzed for pH, conductivity, total organic extractables (TOE), total organic carbon (TOC), total organic halides (TOX), metals, phenols, polychlorinated biphenyls (PCBs/pecticides), volatile organic acids (VOAs), base neutrals (B/N), and acid extractables (acids). Table G-1 summarizes the analytical methods used for each parameter of interest. Table G-2 lists the analytical holding times and preservatives which were used for all ground and surface waters. Soils, sediments, sludges, and fish were kept at 4°C until analyzed. These were not required holding times for these matrices, but every effort was made to extract the smaples within seven days for organic analysis.

In situ parameters, to include pH and conductivity, were measured to give information as to the conditions of the area at the time of the sampling.

The analytical protocol was directed towards screening to identify major organic compounds and metals. The screening procedure included analyzing for TOE, TOC, TOX, metals and phenols. TOE was analyzed by freon extraction followed by infrared determination. TOC was measured by the method of combustion using the Oceanography International Model 915A TOC analyzer. Metals analyses was carried out on a Jarrel-Ash 1100 Simultaneous Inductively Coupled Argon Plasma Spectrometer (ICAP). This procedure has the capability of analyzing up to 33 metals simultaneously on a sample. For the initial phase of the survey, the 13 metals listed in Table G-3 were determined by ICAP, with data for the additional 20 metals made available for further waste characterization. Total phenols were determined spectrophotometrically by the 4-aminoantipyrine (4-AAP) method. TOX was determined by the microconlumetric-titration method using the Dohrman DX-20 TOX system. Detection limits for the above parameters in both liquid (ground water

Table G-1. Analytical Methodology

Parameter	Method	Method Reference (Ground Water and Surface Water)	Method Reference (Sediments, Soil, Sludges, and Fish)
pH	Electrometric	1 (150.1)	Not Applicable
Conductivity	Wheatstone Bridge	1 (120.1)	Not Applicable
TOE	Spectrophotometric, Infrared	1 (413.2)	6 (739)
TOC	Combustion	1 (415.1)	1 (415.1)
TOX	Microcoulometric Titration	3 (450.1)	3 (450.1)
Metals	ICAP	2	2
Phenol	Spectrophotometric 4-AAP	1 (420.1)	6 (417)
PCB/pesticides	GC/EC	4 (608)	7
VOA	GCMS	4 (624)	5
B/N	GCMS	4 (625)	5
Acids	GCMS	4 (625)	5

1 Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020, March 1979.
2 Federal Register, Vol. 44, No. 233, Monday, December 3, 1979, pp. 69559-69567.
3 EPA, EMSL, Cincinnati, Ohio, November 1980, Method 450.1.
4 EPA, EMSL, Cincinnati, Ohio, July 1982, Method 608, 624, 625.
5 Extraction and Analysis of Priority Pollutants in Sediment and Soil, EPA, Athens, Georgia, November, 1981.
6 Chemistry Laboratory Manual for Sediment and Elutriate Testing, EPA-905/4-79-014, March 1979.
7 Interim Methods for the Sampling and Analysis of Priority Pollutants in Sediments and Fish Tissue, EPA, EMSL, Cincinnati, Ohio, 1977.

Source: ESE, 1983.

Table G-2. Analytical Holding Times and Preservatives

Parameter	Holding Time	Preservative
pH	6 hours	Determine onsite
Conductivity	24 hours	Cool, 4°C
TOE	28 days	Cool, 4°C H_2SO_4 pH <2
TOC	28 days	Cool, 4°C H_2SO_4 pH <2
TOX	7 days (until extraction) 30 days (after extraction)	Cool, 4°C
Metals	6 months except Hg 28 days	HNO_3 pH <2
Phenol	28 days	Cool, 4°C H_2SO_4 pH <2 1.0 g $CuSO_4$/L
PCB/Pesticides	7 days (until extraction) 30 days (after extraction)	Cool, 4°C
VOA	7 days (until extraction) 30 days (after extraction)	Cool, 4°C
B/N	7 days (until extraction) 30 days (after extraction)	Cool, 4°C
Acids	7 days (until extraction) 30 days (after extraction)	Cool, 4°C

Source: ESE, 1983.

and surface water) and solid (sediments, soils, and fish) matrices are given in Table G-3. The detection limits given in Table G-3 are values typically achieved by the methods described above. For any individual data set, the actual detection limits are a function of matrix type, chemical interferences, instrument noise, and other factors affecting the individual analytical run. The appendices in this report which present the chemical results may contain detection limits which deviate from Table G-3 because of these factors. Different detection limits arise for each individual data set depending upon the instrument readings for repetitive blanks for the lowest standards included in the run.

Selected samples were analyzed by gas chromatography (GC) and gas chromatography/mass spectroscopy (GC/MS) for qualitative and quantitative identification. PCBs/pesticides were analyzed by GC with electron capture detector. Detection limits for this method are summarized in Method 608 Organochlorine Pesticides and PCBs (Appendix A in the Work Plan). The GC/MS analysis determined the organic compounds on the priority pollutant list. VOA, B/N, and acid compounds were analyzed by GC/MS. Detection limits for these compounds are given in Federal Register, Methods 624 and 625 (Appendix A in the Work Plan).

Table G-3. Typical Analytical Detection Limits

Parameter	Detection Limit Water	Detection Limit Soils, Sediments, and Fish
TOC	0.5 mg/L	500 mg/kg
Phenol	5 ug/L	500 mg/kg
Silver	0.003 mg/L	0.3 mg/kg
Arsenic	0.05 mg/L	5.0 mg/kg
Beryllium	0.001 mg/L	0.1 mg/kg
Cadmium	0.002 mg/L	0.2 mg/kg
Chromium	0.005 mg/L	0.5 mg/kg
Copper	0.002 mg/L	0.2 mg/kg
Mercury	0.030 mg/L	3.0 mg/kg
Nickel	0.010 mg/L	1.0 mg/kg
Lead	0.025 mg/L	2.5 mg/kg
Selenium	0.05 mg/L	5.0 mg/kg
Antimony	0.05 mg/L	5.0 mg/kg
Thallium	0.05 mg/L	5.0 mg/kg
Zinc	0.004 mg/L	0.4 mg/kg
TOE	0.2 mg/L	650 mg/kg
TOX	10 ug/L	10 ug/kg

Source: ESE, 1983.

BOOKMARK

ENVIRONMENTAL SCIENCE & ENGINEERING 08/31/83 FIELD GROUP FRWT1 STATUS IS FINAL

PROJECT NUMBER 83801210
SAMPLES: FRGW4
PROJECT MANAGER DAVE MIZELL

PROJECT NAME FRENCH LTD HAZWASTE
PARAMETERS: FRGW1
FIELD GROUP LEADER RICK FOLKEMER

		SAMPLE NUMBERS					
		GW01	GW01D	GW05	GW07	GW08	GW09
PARAMETERS	STORET #	229900	229901	229905	229907	229908	229909
DATE		4/18/83	4/18/83	4/20/83	4/19/83	4/19/83	4/19/83
TIME		1500	1515	1015	1000	1735	1820
ARSENIC,TOTAL(UG/L)	1002	<45	<45	<45	<45	<45	<45
BERYLLIUM,T,(UG/L)	1012	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
CADMIUM,TOTAL(UG/L)	1027	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0
CHROMIUM,TOTAL(UG/L)	1034	26	17	13	12	<7.0	23
COPPER,TOTAL(UG/L)	1042	7.6	6.0	4.3	<4.0	<4.0	4.9
LEAD,TOTAL(UG/L)	1051	<5.0	5.7	<5.0	<5.0	<5.0	5.9
MERCURY,TOTAL(UG/L)	71900	0.7	0.3	0.3	<0.2	<0.2	<0.2
NICKEL,T,(UG/L)	1067	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
SELENIUM,TOTAL(UG/L)	1147	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
SILVER,TOTAL(UG/L)	1077	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
THALLIUM,T,(UG/L)	1059	<40	<40	<40	<40	<40	<40
ZINC,TOTAL(UG/L)	1092	16.1	11.1	49.5	41.6	40.3	21.2
ALDRIN (UG/L)	39330	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
BHC,A (UG/L)	39337	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
BHC,B (UG/L)	39338	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
BHC,D (UG/L)	39259	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
BHC,G(LINDANE)(UG/L)	39340	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
CHLORDANE (UG/L)	39350	<0.35	<0.35	<0.35	<0.35	<0.35	<0.35
4,4'-DDD (UG/L)	39310	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100
4,4'-DDE (UG/L)	39320	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025

ENVIRONMENTAL SCIENCE & ENGINEERING 08/31/83 FIELD GROUP FRWT1 STATUS IS FINAL

PROJECT NUMBER 83801210
SAMPLES:
PROJECT MANAGER DAVE MIZELL

PROJECT NAME FRENCH LTD HAZWASTE
FIELD GROUP LEADER RICK FOLKEMER

PARAMETERS	STORET #	GW01 229900	GW01D 229901	GW05 229905	GW07 229907	GW08 229908	GW09 229909
		SAMPLE NUMBERS					
DATE		4/18/83	4/18/83	4/20/83	4/19/83	4/19/83	4/19/83
TIME		1500	1515	1015	1000	1735	1820
4,4'-DDT (UG/L)	39300	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100
DIELDRIN (UG/L)	39380	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
A-ENDOSULFAN (UG/L)	34361	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
B-ENDOSULFAN (UG/L)	34356	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100
ENDOSULFAN SULFATE (UG/L)	34351	<0.100	<0.20	<0.100	<0.100	<0.100	<0.100
ENDRIN (UG/L)	39390	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100
ENDRIN ALDEHYDE(UG/L)	34366	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
HEPTACHLOR (UG/L)	39410	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
HEPTACHLOR EPOXIDE (UG/L)	39420	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
TOXAPHENE (UG/L)	39400	<1.60	<1.60	<1.60	<1.60	<1.60	<1.60
ACROLEIN (UG/L)	34210	<10	<10	<10	<10	<10	<10
ACRYLONITRILE (UG/L)	34215	<10	<10	<10	<10	<10	<10
BENZENE (UG/L)	34030	<1	<1	<1	<1	18[illegible]	100
BROMOMETHANE (UG/L)	34413	<2	<2	<2	<2	<2	<2
BROMODICHLOROMETHANE (UG/L)	32101	<1	<1	<1	<1	<1	<1
BROMOFORM (UG/L)	32104	<2	<2	<2	<2	<2	<2
CARBON TETRACHLORIDE (UG/L)	32102	<2	<2	<2	<2	44	<2
CHLOROBENZENE (UG/L)	34301	7	6	<1	6	4	<1
CHLOROETHANE (UG/L)	34311	<3	<3	<3	<3	45	4
CHLOROFORM (UG/L)	32106	<1	<1	<1	<1	290	<1

ENVIRONMENTAL SCIENCE & ENGINEERING 08/31/83 FIELD GROUP FRWT1 STATUS IS FINAL

PROJECT NUMBER 83801210
SAMPLES:
PROJECT MANAGER DAVE MIZELL

PROJECT NAME FRENCH LTD HAZWASTE
FIELD GROUP LEADER RICK FOLKEMER

		SAMPLE NUMBERS					
		GW01	GW01D	GW05	GW07	GW08	GW09
PARAMETERS	STORET #	229900	229901	229905	229907	229908	229909
DATE		4/18/83	4/18/83	4/20/83	4/19/83	4/19/83	4/19/83
TIME		1500	1515	1015	1000	1735	1820
CHLOROMETHANE (UG/L)	34418	<3	<3	<3	<3	<3	<3
DIBROMOCHLOROMETHANE (UG/L)	34306	<2	<2	<2	<2	<2	<2
DICHLORODIFLUOROMETHANE(UG/L)	34668	<3	<3	<3	<3	<3	<3
1,1-DICHLOROETHANE (UG/L)	34496	<1	<1	<1	<1	130	<1
1,2-DICHLOROETHANE (UG/L)	34531	<2	<2	<2	<2	440	<2
1,1-DICHLOROETHYLENE (UG/L)	34501	<2	<2	<2	<2	10	<2
T-1,2-DICHLOROETHENE (UG/L)	34546	<2	<2	<2	<2	180	<2
1,2-DICHLOROPROPANE (UG/L)	34541	<2	<2	<2	<2	<2	<2
CIS-1,3-DICHLOROPROPENE (UG/L)	34704	<2	<2	<2	<2	<2	<2
T-1,3-DICHLOROPROPENE (UG/L)	34699	<1	<1	<1	<1	<1	<1
ETHYLBENZENE (UG/L)	34371	<2	<2	<2	<2	25	58
METHYLENE CHLORIDE (UG/L)	34423	<2	<2	<2	<2	74	<2
1,1,2,2-TETRACHLOROETHANE(UG/L	34516	<1	<1	<1	<1	<1	<1
TETRACHLOROETHENE (UG/L)	34475	<3	<3	<3	<3	910	<3
1,1,1-TRICHL*ETHANE (UG/L)	34506	<2	<2	<2	<2	<2	<2
1,1,2-TRICHL*ETHANE (UG/L)	34511	<2	<2	<2	<2	<2	<2
TRICHLOROETHENE (UG/L)	39180	<2	<2	<2	<2	44	<2
TRICHLOROFLUOROMETHANE (UG/L)	34488	<2	<2	<2	<2	<2	<2
TOLUENE (UG/L)	34010	<1	<1	<1	<1	67	31
VINYL CHLORIDE (UG/L)	39175	<2	<2	<2	<2	39	<2

ENVIRONMENTAL SCIENCE & ENGINEERING 08/31/83 FIELD GROUP FRWT1 STATUS IS FINAL

PROJECT NUMBER 83801210 PROJECT NAME FRENCH LTD HAZWASTE
SAMPLES:
PROJECT MANAGER DAVE MIZELL FIELD GROUP LEADER RICK FOLKEHER

		SAMPLE NUMBERS					
		GW01	GW01D	GW05	GW07	GW08	GW09
PARAMETERS	STORET #	229900	229901	229905	229907	229908	229909
DATE		4/18/83	4/18/83	4/20/83	4/19/83	4/19/83	4/19/83
TIME		1500	1515	1015	1000	1735	1820
2-CHLOROETHYLVINYL ETHER(UG/L)	34576	<3	<3	<3	<3	<3	<3

ENVIRONMENTAL SCIENCE & ENGINEERING 08/31/83 FIELD GROUP FRWT1 STATUS IS FINAL

PROJECT NUMBER 83801210
SAMPLES: FRGW3
PROJECT MANAGER DAVE MIZELL

PROJECT NAME FRENCH LTD HAZWASTE
PARAMETERS: FRSW3
FIELD GROUP LEADER RICK FOLKEMER

PARAMETERS	STORET #	GW01 229900	GW01D 229901	GW02 229902	GW03 229903	GW04 229904	GW05 229905	GW06 229906	GW07 229907	GW08 229908	GW09 229909
		SAMPLE NUMBERS									
DATE		4/18/83	4/18/83	4/19/83	4/19/83	4/19/83	4/20/83	4/20/83	4/19/83	4/19/83	4/19/83
TIME		1500	1515	1220	1330	1600	1015	1515	1000	1735	1820
PH,(STD UNITS)	400	7.10	7.10	7.80	6.20	6.70	5.10	9.30	6.50	5.60	6.50
SP.COND.,FIELD (UMHOS/CM)	94	1300	1440	509	575	1090	135	524	773	2420	939
TOE (MG/L)	99343	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00
CARBON,TOC(MG/L)	680	<1.0	<1.0	<1.0	20.0	<1.0	3.4	4.8	6.3	149	69.0
PHENOLS (UG/L)	32730	5	<1	NA	NA	NA	NA	NA	4	100	17
TOX (UG/L-CL)	70353	<50	<50	<50	94	<50	81	<50	180.	3000	<50

ENVIRONMENTAL SCIENCE & ENGINEERING 08/31/83 FIELD GROUP FRWT1 STATUS IS FINAL

PROJECT NUMBER 83801210
SAMPLES: FRGW3
PROJECT MANAGER DAVE MIZELL

PROJECT NAME FRENCH LTD HAZWASTE
PARAMETERS: FRSW3
FIELD GROUP LEADER RICK FOLKEMER

SAMPLE NUMBERS

PARAMETERS	STORET #	GW10 229910	GW11 229911
DATE		4/18/83	4/18/83
TIME		1200	1115
PH,(STD UNITS)	400	7.70	7.50
SP.COND.,FIELD (UMHOS/CM)	94	483	503
TOE (MG/L)	99343	<5.00	<5.00
CARBON,TOC(MG/L)	680	4.3	<1.0
PHENOLS (UG/L)	32730	<1	1
TOX (UG/L-CL)	70353	<50	<50

H-6

ENVIRONMENTAL SCIENCE & ENGINEERING 08/31/83 FIELD GROUP FRWT1 STATUS IS FINAL

PROJECT NUMBER 83801210
SAMPLES: FRGW5
PROJECT MANAGER DAVE MIZELL

PROJECT NAME FRENCH LTD HAZWASTE
PARAMETERS: FRGW2
FIELD GROUP LEADER RICK FOLKEMER

		SAMPLE NUMBERS						
		GW01	GW01D	GW05	GW06	GW08	GW09	GW11
PARAMETERS	STORET #	229900	229901	229905	229906	229908	229909	229911
DATE		4/18/83	4/18/83	4/20/83	4/20/83	4/19/83	4/19/83	4/18/83
TIME		1500	1515	1015	1515	1735	1820	1115
ACENAPHTHYLENE (UG/L)	34200	<5	<5	<5	<5	<5	<5	<5
ANTHRACENE (UG/L)	34220	<5	<5	<5	<5	<5	<5	<5
BENZO(A)ANTHRACENE (UG/L)	34526	<5	<5	<5	<5	<5	<5	<5
BENZO(B)FLUORANTHENE (UG/L)	34230	<5	<5	<5	<5	<5	<5	<5
BENZO(K)FLUORANTHENE (UG/L)	34242	<5	<5	<5	<5	<5	<5	<5
BENZO(A)PYRENE (UG/L)	34247	<5	<5	<5	<5	<5	<5	<5
BENZO(GHI)PERYLENE (UG/L)	34521	<5	<5	<5	<5	<5	<5	<5
BENZIDINE (UG/L)	39120	<5	<5	<5	<5	<5	<5	<5
BIS(2-CHLOROETHYL)ET HER (UG/L)	34273	<5	<5	<5	<5	<5	<5	<5
BIS(2-CHLOROETHOXY)M ETHAN(UG/L	34278	<5	<5	<5	<5	<5	<5	<5
BIS(2-ETHYLHEXYL) PHTH(UG/L)	39100	<5	<5	<5	<5	<5	13	<5
BIS(2-CHLOROISOPROP) ETHER(UG/L	34283	<5	<5	<5	<5	<5	<5	<5
4-BROMOPHENYLPHENYLE THER(UG/L)	34636	<5	<5	<5	<5	<5	<5	<5
BUTYL BENZYL PHTHALA TE (UG/L)	34292	<5	<5	<5	<5	<5	<5	<5
2-CHLORONAPHTHALENE (UG/L)	34581	<5	<5	<5	<5	<5	<5	<5
4-CHLOROPHENYLPHENYL ETHER(UG/L	34641	<5	<5	<5	<5	<5	<5	<5
CHRYSENE (UG/L)	34320	<5	<5	<5	<5	<5	<5	<5
DIBENZO(A,H)ANTHRACE NE (UG/L)	34556	<5	<5	<5	<5	<5	<5	<5
DI-N-BUTYLPHTHALATE (UG/L)	39110	<5	<5	<5	<5	<5	<5	<5
1,3,DICHLOROBENZENE (UG/L)	34566	<5	<5	<5	<5	<5	<5	<5

ENVIRONMENTAL SCIENCE & ENGINEERING 08/31/83 FIELD GROUP FRWT1 STATUS IS FINAL

PROJECT NUMBER 83801210 PROJECT NAME FRENCH LTD HAZWASTE
SAMPLES:
PROJECT MANAGER DAVE MIZELL FIELD GROUP LEADER RICK FOLKEMER

PARAMETERS	STORET #	GW01 229900	GW01D 229901	GW05 229905	GW06 229906	GW08 229908	GW09 229909	GW11 229911
DATE		4/18/83	4/18/83	4/20/83	4/20/83	4/19/83	4/19/83	4/18/83
TIME		1500	1515	1015	1515	1735	1820	1115
1,4-DICHLOROBENZENE (UG/L)	34571	<5	<5	<5	<5	<5	<5	<5
1,2-DICHLOROBENZENE (UG/L)	34536	<5	<5	<5	<5	<5	<5	<5
3,3'-DICHLOROBENZIDINE (UG/L)	34631	<5	<5	<5	<5	<5	<5	<5
DIETHYLPHTHALATE (UG/L)	34336	<5	<5	<5	<5	<5	<5	<5
DIMETHYLPHTHALATE (UG/L)	34341	<5	<5	<5	<5	<5	<5	<5
2,4-DINITROTOLUENE (UG/L)	34611	<5	<5	<5	<5	<5	<5	<5
2,6-DINITROTOLUENE (UG/L)	34626	<5	<5	<5	<5	<5	<5	<5
DIOCTYLPHTHALATE (UG/L)	34596	<5	<5	<5	<5	<5	<5	<5
1,2-DIPHENYLHYDRAZINE (UG/L)	34346	<5	<5	<5	<5	<5	<5	<5
FLUORANTHENE (UG/L)	34376	<5	<5	<5	<5	<5	<5	<5
FLUORENE (UG/L)	34381	<5	<5	<5	<5	<5	<5	<5
HEXACHLOROBENZENE (UG/L)	39700	<5	<5	<5	<5	<5	<5	<5
HEXACHLOROBUTADIENE (UG/L)	34391	<5	<5	<5	<5	<5	<5	<5
HEXACHLOROETHANE (UG/L)	34396	<5	<5	<5	<5	<5	<5	<5
HEXACHLOROCYCLOPENTADIENE(UG/L	34386	<5	<5	<5	<5	<5	<5	<5
INDENO(1,2,3-CD)PYRENE (UG/L)	34403	<5	<5	<5	<5	<5	<5	<5
ISOPHORONE (UG/L)	34408	<5	<5	<5	<5	<5	<5	<5
NAPHTHALENE (UG/L)	34696	<5	<5	<5	<5	150	6	<5
NITROBENZENE (UG/L)	34447	<5	<5	<5	<5	<5	<5	<5
N-NITROSODIMETHYLAMINE (UG/L)	34438	<5	<5	<5	<5	<5	<5	<5

ENVIRONMENTAL SCIENCE & ENGINEERING 08/31/83 FIELD GROUP FRWT1 STATUS IS FINAL

PROJECT NUMBER 83801210
SAMPLES:
PROJECT MANAGER DAVE MIZELL

PROJECT NAME FRENCH LTD HAZWASTE
FIELD GROUP LEADER RICK FOLKEMER

		SAMPLE NUMBERS						
PARAMETERS	STORET #	GW01 229900	GW01D 229901	GW05 229905	GW06 229906	GW08 229908	GW09 229909	GW11 229911
DATE		4/18/83	4/18/83	4/20/83	4/20/83	4/19/83	4/19/83	4/18/83
TIME		1500	1515	015	1515	1735	1820	1115
N-NITROSODIPROPYLAMINE (UG/L)	34428	<5	<5	<5	<5	<5	<5	<5
N-NITROSODIPHENYLAMINE (UG/L)	34433	<5	<5	<5	<5	<5	15	<5
PHENANTHRENE (UG/L)	34461	<5	<5	<5	<5	<5	<5	<5
PYRENE (UG/L)	34469	<5	<5	<5	<5	<5	<5	<5
2,3,7,8-TCDD(UG/L)	34675	<10	<10	<10	<10	<10	<10	<10
1,2,4-TRICHLOROBENZENE (UG/L)	34551	<5	<5	<5	<5	<5	<5	<5
4-CHL*-3-METH*PHENOL (UG/L)	34452	<5	<5	<5	<5	<5	<5	<5
2-CHLOROPHENOL(UG/L)	34586	<5	<5	<5	<5	<5	<5	<5
2,4-DICHLOROPHENOL (UG/L)	34601	<5	<5	<5	<5	<5	<5	<5
2,4-DIMETHYLPHENOL (UG/L)	34606	<5	<5	<5	<5	<5	<5	<5
2,4-DINITROPHENOL (UG/L)	34616	<5	<5	<5	<5	<5	<5	<5
2-METHYL-4,6-DINITRO PHENL(UG/L	34657	<5	<5	<5	<5	<5	<5	<5
2-NITROPHENOL (UG/L)	34591	<5	<5	<5	<5	<5	<5	<5
4-NITROPHENOL (UG/L)	34646	<5	<5	<5	<5	<5	<5	<5
PENTACHLOROPHENOL (UG/L)	39032	<5	<5	<5	<5	<5	<5	<5
PHENOL (UG/L)	34694	<5	<5	<5	<5	32	<5	<5
2,4,6-TRICHL*PHENOL (UG/L)	34621	<5	<5	<5	<5	<5	<5	<5
T-1,2-DICHLOROETHENE (UG/L)	34546	<2	<2	<2	NA	180	<2	NA

ENVIRONMENTAL SCIENCE & ENGINEERING   01/11/84   STATUS: PRELIMINARY

PROJECT NUMBER 82422420
FIELD GROUP: FRGW2
PARAMETERS: ALL   SAMPLES: ALL

PROJECT NAME FRENCH PHASE 2
PROJECT MANAGER: RICK FOLKEMER
FIELD GROUP LEADER: R.FOLKEMER

		SAMPLE NUMBERS							
PARAMETERS	STORET #	GW15D 299010	GW16 299011	GW17 299012	GW18 299013	GW19 299014	GW20 299015	GW21 299016	GW22 299017
DATE		11/29/83	11/29/83	11/28/83	11/28/83	11/28/83	11/28/83	11/28/83	11/28/83
TIME		1525	1630	1645	1600	1000	1300	1100	1500
1,1-DICHLOROETHYLENE (UG/L)	34501	<2	<2	<2	<2	<2	<2	<2	<2
T-1,2-DICHLOROETHENE (UG/L)	34546	<2	<2	<2	<2	<2	<2	<2	<2
1,2-DICHLOROPROPANE (UG/L)	34541	<1	<1	<1	<1	<1	<1	<1	<1
CIS-1,3-DICH*PROPENE (UG/L)	34704	<2	<2	<2	<2	<2	<2	<2	<2
T-1,3-DICHL*PROPENE (UG/L)	34699	<1	<1	<1	<1	<1	<1	<1	<1
ETHYLBENZENE (UG/L)	34371	<2	<2	<2	<2	<2	<2	<2	<2
METHYLENE CHLORIDE (UG/L)	34423	<2	<2	<2	<2	<2	<2	<2	<2
1,1,2,2-TE*CH*ETHANE (UG/L)	34516	<1	<1	<1	<1	<1	<1	<1	<1
TETRACHLOROETHENE (UG/L)	34475	<3	<3	<3	<3	<3	<3	<3	<3
1,1,1-TRICHL*ETHANE (UG/L)	34506	<2	<2	<2	<2	<2	<2	<2	<2
1,1,2-TRICHL*ETHANE (UG/L)	34511	<2	<2	<2	<2	<2	<2	<2	<2
TRICHLOROETHENE (UG/L)	39180	<2	<2	<2	<2	<2	<2	<2	<2
TRICHL*FLUOROMETHANE (UG/L)	34488	<3	<3	<3	<3	<3	<3	<3	<3
TOLUENE (UG/L)	34010	<1	<1	<1	<1	<1	<1	<1	<1
VINYL CHLORIDE(UG/L)	39175	5	<2	<2	<2	<2	<2	<2	<2
2-CHL*ETH*VINYLETHER (UG/L)	34576	<2	<2	<2	<2	<2	<2	<2	<2

ENVIRONMENTAL SCIENCE & ENGINEERING 1/11/84 STATUS: PRELIMINARY

PROJECT NUMBER 8242242L
FIELD GROUP: FRGW2
PARAMETERS: ALL SAMPLES: ALL

PROJECT NAME FRENCH PHASE 2
PROJECT MANAGER: RICK FOLKEMER
FIELD GROUP LEADER: R.FOLKEMER

		SAMPLE NUMBERS							
PARAMETERS	STORET #	GW15D 299010	GW16 299011	GW17 299012	GW18 299013	GW19 299014	GW20 299015	GW21 299016	GW22 299017
DATE		11/29/83	11/29/83	11/28/83	11/28/83	11/28/83	11/28/83	11/28/83	11/28/83
TIME		1525	1630	1645	1600	1000	1300	1100	1500
PH,(STD UNITS)	400	6.40	5.80	6.40	6.70	6.70	6.80	6.40	7.10
SP.COND.,FIELD (UMHOS/CM)	94	205	108	302	361	1730	1210	1580	879
CARBON,TOC(MG/L)	680	10.3	5.0	4.3	9.9	23.2	35.8	82.9	3.9
TOX (UG/L-CL)	70353	38	91	32	66	49	73	250	120
PHENOLS (UG/L)	32730	<1	<1	<1	<1	2	8	26	<1
ACROLEIN (UG/L)	34210	<10	<10	<10	<10	<10	<10	<10	<10
ACRYLONITRILE (UG/L)	34215	<10	<10	<10	<10	<10	<10	<10	<10
BENZENE (UG/L)	34030	<1	<1	<1	<1	<1	6	11	<1
BROMOMETHANE (UG/L)	34413	<3	<3	<3	<3	<3	<3	<3	<3
BROMODICHLOROMETHANE (UG/L)	32101	<2	<2	<2	<2	<2	<2	<2	<2
BROMOFORM (UG/L)	32104	<3	<3	<3	<3	<3	<3	<3	<3
CARBON TETRACHLORIDE (UG/L)	32102	<2	<2	<2	<2	<2	<2	<2	<2
CHLOROBENZENE (UG/L)	34301	<1	<1	<1	<1	<1	4	2	<1
CHLOROETHANE (UG/L)	34311	<3	<3	<3	<3	<3	<3	<3	<3
CHLOROFORM (UG/L)	32106	<1	<1	<1	<1	<1	<1	<1	<1
CHLOROMETHANE (UG/L)	34418	<2	<2	<2	<2	<2	<2	<2	<2
DIBROMOCHLOROMETHANE (UG/L)	34306	<2	<2	<2	<2	<2	<2	<2	<2
DICHLORODIFLUOROMETHANE (UG/L)	34668	<3	<3	<3	<3	<3	<3	<3	<3
1,1-DICHLOROETHANE (UG/L)	34496	2	<1	<1	<1	<1	<1	<1	<1
1,2-DICHLOROETHANE (UG/L)	34531	<2	<2	2	<2	<2	<2	2	<2

ENVIRONMENTAL SCIENCE & ENGINEERING 1/11/84 STATUS: PRELIMINARY

PROJECT NUMBER 82422420
FIELD GROUP: FRGW2
PARAMETERS: ALL SAMPLES: ALL

PROJECT NAME FRENCH PHASE 2
PROJECT MANAGER: RICK FOLKEMER
FIELD GROUP LEADER: R.FOLKEMER

SAMPLE NUMBERS

PARAMETERS	STORET #	GW03 299000	GW05 299001	GW06 299002	GW10 299003	GW10D 299004	GW11 299005	GW12 299006	GW13 299007	GW14 299008	GW15 299009
DATE		11/29/83	11/30/83	11/29/83	11/29/83	11/29/83	11/29/83	11/30/83	11/30/83	12/21/83	11/29/83
TIME		920	1800	1230	1515	1515	1445	1200	945	1530	1525
1,1-DICHLOROETHYLENE (UG/L)	34501	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
T-1,2-DICHLOROETHENE (UG/L)	34546	8	<2	20	<2	<2	<2	<2	<2	<2	<2
1,2-DICHLOROPROPANE (UG/L)	34541	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
CIS-1,3-DICH*PROPENE (UG/L)	34704	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
T-1,3-DICHL*PROPENE (UG/L)	34699	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
ETHYLBENZENE (UG/L)	34371	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
METHYLENE CHLORIDE (UG/L)	34423	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
1,1,2,2-TE*CH*ETHANE (UG/L)	34516	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
TETRACHLOROETHENE (UG/L)	34475	<3	<3	16	<3	<3	<3	<3	<3	<3	<3
1,1,1-TRICHL*ETHANE (UG/L)	34506	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
1,1,2-TRICHL*ETHANE (UG/L)	34511	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
TRICHLOROETHENE (UG/L)	39180	<2	<2	8	<2	<2	<2	<2	<2	<2	<2
TRICHL*FLUOROMETHANE (UG/L)	34488	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
TOLUENE (UG/L)	34010	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
VINYL CHLORIDE(UG/L)	39175	5	<2	<2	<2	<2	<2	<2	<2	<2	5
2-CHL*ETH*VINYLETHER (UG/L)	34576	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2

ENVIRONMENTAL SCIENCE & ENGINEERING 01/11/84 STATUS: PRELIMINARY

PROJECT NUMBER 82422421
FIELD GROUP: FRGW2
PARAMETERS: ALL SAMPLES: ALL

PROJECT NAME FRENCH PHASE 2
PROJECT MANAGER: RICK FOLKEMER
FIELD GROUP LEADER: R.FOLKEMER

		SAMPLE NUMBERS									
PARAMETERS	STORET #	GW03 299000	GW05 299001	GW06 299002	GW10 299003	GW10D 299004	GW11 299005	GW12 299006	GW13 299007	GW14 299008	GW15 299009
DATE		11/29/83	11/30/83	11/29/83	11/29/83	11/29/83	11/29/83	11/30/83	11/30/83	12/21/83	11/29/83
TIME		920	1800	1230	1515	1515	1445	1200	945	1530	1525
PH,(STD UNITS)	400	6.40	5.90	9.30	NA	NA	NA	8.80	6.80	NA	6.40
SP.COND.,FIELD (UMHOS/CM)	94	615	175	493	NA	NA	NA	496	450	NA	205
CARBON,TOC(MG/L)	680	21.2	7.6	5.9	<1.0	<1.0	<1.0	5.9	9.8	5.8	10.2
TOX (UG/L-CL)	70353	280	100	170	100	63	68	58	97	52	61
PHENOLS (UG/L)	32730	2	<1	<1	<1	<1	<1	<1	<1	1	<1
ACROLEIN (UG/L)	34210	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
ACRYLONITRILE (UG/L)	34215	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
BENZENE (UG/L)	34030	22	<1	<1	<1	<1	<1	<1	<1	<1	<1
BROMOMETHANE (UG/L)	34413	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
BROMODICHLOROMETHANE (UG/L)	32101	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
BROMOFORM (UG/L)	32104	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
CARBON TETRACHLORIDE (UG/L)	32102	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
CHLOROBENZENE (UG/L)	34301	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
CHLOROETHANE (UG/L)	34311	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
CHLOROFORM (UG/L)	32106	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
CHLOROMETHANE (UG/L)	34418	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
DIBROMOCHLOROMETHANE (UG/L)	34306	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
DICHLORODIFLUOROMETHANE (UG/L)	34668	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
1,1-DICHLOROETHANE (UG/L)	34496	23	<1	<1	<1	<1	<1	<1	<1	<1	2
1,2-DICHLOROETHANE (UG/L)	34531	25	<2	12	<2	<2	<2	<2	<2	<2	<2

BOOKMARK

APPENDIX I

Chemical Results--Surface Water

ENVIRONMENTAL SCIENCE & ENGINEERING 08/31/83 FIELD GROUP FRWT1 STATUS IS FINAL

PROJECT NUMBER 83801210
SAMPLES: PART
PROJECT MANAGER DAVE MIZELL

PROJECT NAME FRENCH LTD HAZWASTE
PARAMETERS: PESTW
FIELD GROUP LEADER RICK FOLKEMER

		SAMPLE NUMBERS				
		SW01	SW02	SW04	SW05	SW06
PARAMETERS	STORET #	229913	229914	229917	229918	229919
DATE		4/15/83	4/15/83	4/16/83	4/14/83	4/14/83
TIME		1100	1300	1500	1030	1330
ALDRIN (UG/L)	39330	<0.010	<0.010	<0.010	<0.010	<0.010
BHC,A (UG/L)	39337	<0.010	<0.010	<0.010	<0.010	<0.010
BHC,B (UG/L)	39338	<0.020	<0.020	<0.020	<0.020	<0.020
BHC,D (UG/L)	39259	<0.015	<0.015	<0.015	<0.015	<0.015
BHC,G(LINDANE)(UG/L)	39340	<0.015	<0.015	0.045	<0.015	<0.015
CHLORDANE (UG/L)	39350	<0.35	<0.35	<0.35	<0.35	<0.35
4,4'-DDD (UG/L)	39310	<0.100	<0.100	<0.100	<0.100	<0.100
4,4'-DDE (UG/L)	39320	<0.025	<0.025	<0.025	<0.025	<0.025
4,4'-DDT (UG/L)	39300	<0.100	<0.100	<0.100	<0.100	<0.100
DIELDRIN (UG/L)	39380	<0.025	<0.025	<0.025	<0.025	<0.025
A-ENDOSULFAN (UG/L)	34361	<0.025	<0.025	<0.025	<0.025	<0.025
B-ENDOSULFAN (UG/L)	34356	<0.100	<0.100	<0.100	<0.100	<0.100
ENDOSULFAN SULFATE (UG/L)	34351	<0.100	<0.100	<0.100	<0.100	<0.100
ENDRIN (UG/L)	39390	<0.100	<0.100	<0.100	<0.100	<0.100
ENDRIN ALDEHYDE(UG/L)	34366	<0.100	<0.100	<0.100	<0.100	<0.100
HEPTACHLOR (UG/L)	39410	<0.010	<0.010	<0.010	<0.010	<0.010
HEPTACHLOR EPOXIDE (UG/L)	39420	<0.020	<0.020	<0.020	<0.020	<0.020
TOXAPHENE (UG/L)	39400	<1.60	<1.60	<1.60	<1.60	<1.60

ENVIRONMENTAL SCIENCE & ENGINEERING 08/31/83

FIELD GROUP FRWT1 STATUS IS FINAL

PROJECT NUMBER 83R01210
SAMPLES:
PROJECT MANAGER DAVE MIZELL

PROJECT NAME FRENCH LTD HAZWASTE

FIELD GROUP LEADER RICK FOLKEMER

SAMPLE NUMBERS

PARAMETERS	STORET #	SW01 229913	SW04 229917	SW06 229919
DATE		4/15/83	4/16/83	4/14/83
TIME		1100	1500	1330
1,2,4-TRICHLOROBENZENE (UG/L)	34551	<5	<5	<5
4-BROMOPHENYLPHENYLETHER(UG/L)	34636	<5	<5	<5

ENVIRONMENTAL SCIENCE & ENGINEERING 08/31/83

PROJECT NUMBER 83801210
SAMPLES:
PROJECT MANAGER DAVE MIZELL

FIELD GROUP FRWT1 STATUS IS FINAL

PROJECT NAME FRENCH LTD HAZWASTE

FIELD GROUP LEADER RICK FOLKEMER

SAMPLE NUMBERS

PARAMETERS	STORET #	SW01 229913	SW04 229917	SW06 229919
DATE		4/15/83	4/16/83	4/14/83
TIME		1100	1500	1330
2,4-DINITROTOLUENE (UG/L)	34611	<5	<5	<5
2,6-DINITROTOLUENE (UG/L)	34626	<5	<5	<5
DIOCTYLPHTHALATE (UG/L)	34596	<5	<5	<5
1,2-DIPHENYLHYDRAZINE (UG/L)	34346	<5	<5	<5
FLUORANTHENE (UG/L)	34376	<5	<5	<5
FLUORENE (UG/L)	34381	<5	<5	<5
HEXACHLOROBENZENE (UG/L)	39700	<5	<5	<5
HEXACHLOROBUTADIENE (UG/L)	34391	<5	<5	<5
HEXACHLOROETHANE (UG/L)	34396	<5	<5	<5
HEXACHLOROCYCLOPENTADIENE(UG/L	34386	<5	<5	<5
INDENO(1,2,3-CD)PYRENE (UG/L)	34403	<5	<5	<5
ISOPHORONE (UG/L)	34408	<5	<5	<5
NAPHTHALENE (UG/L)	34696	<5	<5	<5
NITROBENZENE (UG/L)	34447	<5	<5	<5
N-NITROSODIMETHYLAMINE (UG/L)	34438	<5	<5	<5
N-NITROSODIPROPYLAMINE (UG/L)	34428	<5	<5	<5
N-NITROSODIPHENYLAMINE (UG/L)	34433	<5	<5	<5
PHENANTHRENE (UG/L)	34461	<5	<5	<5
PYRENE (UG/L)	34469	<5	<5	<5
2,3,7,8-TCDD(UG/L)	34675	<10	<10	<10

ENVIRONMENTAL SCIENCE & ENGINEERING 08/31/83

FIELD GROUP FRWT1 STATUS IS FINAL

PROJECT NUMBER 83[illegible]1210
SAMPLES:
PROJECT MANAGER DAVE MIZELL

PROJECT NAME FRENCH LTD HAZWASTE

FIELD GROUP LEADER RICK FOLKEMER

SAMPLE NUMBERS

PARAMETERS	STORET #	SW01 229913	SW04 229917	SW06 229919
DATE		4/15/83	4/16/83	4/14/83
TIME		1100	1500	1330
BENZO(A)PYRENE (UG/L)	34247	<5	<5	<5
BENZO(GHI)PERYLENE (UG/L)	34521	<5	<5	<5
BENZIDINE (UG/L)	39120	<5	<5	<5
BIS(2-CHLOROETHYL)ETHER (UG/L)	34273	<5	<5	<5
BIS(2-CHLOROETHOXY)METHAN(UG/L	34278	<5	<5	<5
BIS(2-ETHYLHEXYL) PHTH(UG/L)	39100	<5	<5	<5
BIS(2-CHLOROISOPROP) ETHER(UG/L	34283	<5	<5	<5
4-BROMOPHENYLPHENYLETHER(UG/L)	34636	<5	<5	<5
BUTYL BENZYL PHTHALATE (UG/L)	34292	<5	<5	<5
2-CHLORONAPHTHALENE (UG/L)	34581	<5	<5	<5
4-CHLOROPHENYLPHENYL ETHER(UG/L	34641	<5	<5	<5
CHRYSENE (UG/L)	34320	<5	<5	<5
DIBENZO(A,H)ANTHRACENE (UG/L)	34556	<5	<5	<5
DI-N-BUTYLPHTHALATE (UG/L)	39110	<5	<5	<5
1,3,DICHLOROBENZENE (UG/L)	34566	<5	<5	<5
1,4-DICHLOROBENZENE (UG/L)	34571	<5	<5	<5
1,2-DICHLOROBENZENE (UG/L)	34536	<5	<5	<5
3,3'-DICHLOROBENZIDINE (UG/L)	34631	<5	<5	<5
DIETHYLPHTHALATE (UG/L)	34336	<5	<5	<5
DIMETHYLPHTHALATE (UG/L)	34341	<5	<5	<5

ENVIRONMENTAL SCIENCE & ENGINEERING 08/31/83

FIELD GROUP FRWT1 STATUS IS FINAL

PROJECT NUMBER 83801210
SAMPLES:
PROJECT MANAGER DAVE MIZELL

PROJECT NAME FRENCH LTD HAZWASTE

FIELD GROUP LEADER RICK FOLKEMER

SAMPLE NUMBERS

PARAMETERS	STORET #	SW01 229913	SW04 229917	SW06 229919
DATE		4/15/83	4/16/83	4/14/83
TIME		1100	1500	1330
TOLUENE (UG/L)	34010	<1	<1	<1
VINYL CHLORIDE (UG/L)	39175	2	<2	<2
2-CHLOROETHYLVINYL ETHER(UG/L)	34576	<3	<3	<3
4-CHL*-3-METH*PHENOL (UG/L)	34452	<5	<5	<5
2-CHLOROPHENOL(UG/L)	34586	<5	<5	<5
2,4-DICHLOROPHENOL (UG/L)	34601	<5	<5	<5
2,4-DIMETHYLPHENOL (UG/L)	34606	<5	<5	<5
2,4-DINITROPHENOL (UG/L)	34616	<5	<5	<5
2-METHYL-4,6-DINITRO PHENL(UG/L	34657	<5	<5	<5
2-NITROPHENOL (UG/L)	34591	<5	<5	<5
4-NITROPHENOL (UG/L)	34646	<5	<5	<5
PENTACHLOROPHENOL (UG/L)	39032	<5	<5	<5
PHENOL (UG/L)	34694	<5	<5	<5
2,4,5-TRICHL*PHENOL (UG/L)	34621	<5	<5	<5
ACENAPHTHENE (UG/L)	34205	<5	<5	<5
ACENAPHTHYLENE (UG/L)	34200	<5	<5	<5
ANTHRACENE (UG/L)	34220	<5	<5	<5
BENZO(A)ANTHRACENE (UG/L)	34526	<5	<5	<5
BENZO(B)FLUORANTHENE (UG/L)	34230	<5	<5	<5
BENZO(K)FLUORANTHENE (UG/L)	34242	<5	<5	<5

ENVIRONMENTAL SCIENCE & ENGINEERING 08/31/83 FIELD GROUP FRWT1 STATUS IS FINAL

PROJECT NUMBER 83801210
SAMPLES:
PROJECT MANAGER DAVE MIZELL

PROJECT NAME FRENCH LTD HAZWASTE

FIELD GROUP LEADER RICK FOLKEMER

SAMPLE NUMBERS

PARAMETERS	STORET #	SW01 229913	SW04 229917	SW06 229919
DATE		4/15/83	4/16/83	4/14/83
TIME		1100	1500	1330
CHLOROETHANE (UG/L)	34311	<3	<3	<3
CHLOROFORM (UG/L)	32106	3	<1	<1
CHLOROMETHANE (UG/L)	34418	<3	<3	<3
DIBROMOCHLOROMETHANE (UG/L)	34306	<2	<2	<2
DICHLORODIFLUOROMETHANE(UG/L)	34668	<3	<3	<3
1,1-DICHLOROETHANE (UG/L)	34496	2	<1	<1
1,2-DICHLOROETHANE (UG/L)	34531	4	<2	<2
1,1-DICHLOROETHYLENE (UG/L)	34501	<2	<2	<2
T-1,2-DICHLOROETHENE (UG/L)	34546	<2	<2	<2
1,2-DICHLOROPROPANE (UG/L)	34541	<2	<2	<2
CIS-1,3-DICHLOROPROPENE (UG/L)	34704	<2	<2	<2
T-1,3-DICHLOROPROPENE (UG/L)	34699	<1	<1	<1
ETHYLBENZENE (UG/L)	34371	<2	<2	<2
METHYLENE CHLORIDE (UG/L)	34423	<2	<2	<2
1,1,2,2-TETRACHLOROETHANE(UG/L	34516	<1	<1	<1
TETRACHLOROETHENE (UG/L)	34475	<3	<3	<3
1,1,1-TRICHL*ETHANE (UG/L)	34506	<2	<2	<2
1,1,2-TRICHL*ETHANE (UG/L)	34511	<2	<2	<2
TRICHLOROETHENE (UG/L)	39180	<2	<2	<2
TRICHLOROFLUOROMETHANE (UG/L)	34488	<2	<2	<2

ENVIRONMENTAL SCIENCE & ENGINEERING 08/31/83 FIELD GROUP FRWT1 STATUS IS FINAL

PROJECT NUMBER 83801210
SAMPLES: FRSW2
PROJECT MANAGER DAVE MIZELL

PROJECT NAME FRENCH LTD HAZWASTE
PARAMETERS: FRSW1
FIELD GROUP LEADER RICK FOLKEMER

SAMPLE NUMBERS

PARAMETERS	STORET #	SW01 229913	SW04 229917	SW06 229919
DATE		4/15/83	4/16/83	4/14/83
TIME		1100	1500	1330
ARSENIC,TOTAL(UG/L)	1002	<45	<45	<45
BERYLLIUM,T,(UG/L)	1012	<1.0	<1.0	<1.0
CADMIUM,TOTAL(UG/L)	1027	<4.0	<4.0	<4.0
CHROMIUM,TOTAL(UG/L)	1034	13	10	11
COPPER,TOTAL(UG/L)	1042	6.2	5.6	6.6
LEAD,TOTAL(UG/L)	1051	<5.0	<5.0	<5.0
MERCURY,TOTAL(UG/L)	71900	<0.2	0.3	0.3
NICKEL,T,(UG/L)	1067	<10.0	<10.0	<10.0
SELENIUM,TOTAL(UG/L)	1147	<1.0	<1.0	<1.0
SILVER,TOTAL(UG/L)	1077	<0.3	<0.3	<0.3
THALLIUM,T,(UG/L)	1059	<40	<40	<40
ZINC,TOTAL(UG/L)	1092	13.2	16.8	17.9
ACROLEIN (UG/L)	34210	<10	<10	<10
ACRYLONITRILE (UG/L)	34215	<10	<10	<10
BENZENE (UG/L)	34030	2	<1	<1
BROMOMETHANE (UG/L)	34413	<2	<2	<2
BROMODICHLOROMETHANE (UG/L)	32101	<1	<1	<1
BROMOFORM (UG/L)	32104	<2	<2	<2
CARBON TETRACHLORIDE (UG/L)	32102	<2	<2	<2
CHLOROBENZENE (UG/L)	34301	<1	<1	<1

ENVIRONMENTAL SCIENCE & ENGINEERING 08/31/83 FIELD GROUP FRWT1 STATUS IS FINAL

PROJECT NUMBER 83801210
SAMPLES: FRSW4
PROJECT MANAGER DAVE MIZELL

PROJECT NAME FRENCH LTD HAZWASTE
PARAMETERS: FRSW3
FIELD GROUP LEADER RICK FOLKEMER

		SAMPLE NUMBERS							
		SWMAPT	SW01	SW02	SW03	SW03D	SW04	SW05	SW06
PARAMETERS	STORET #	229912	229913	229914	229915	229916	229917	229918	229919
DATE		4/15/83	4/15/83	4/15/83	4/17/83	4/17/83	4/16/83	4/14/83	4/14/83
TIME		1215	1100	1300	915	915	1500	1030	1330
PH,(STD UNITS)	400	8.40	7.70	7.70	7.00	7.00	6.60	7.00	7.10
SP.COND.,FIELD (UMHOS/CM)	94	445	472	447	392	392	645	400	305
TOE (MG/L)	99343	<5.00	NA	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00
CARBON,TOC(MG/L)	680	62.0	62.2	62.7	12.3	10.2	12.2	35.7	12.2
PHENOLS (UG/L)	32730	NA	13	34	2	4	4	10	3
TOX (UG/L-CL)	70353	66	<50	58	<50	<50	<50	<50	<50

ENVIRONMENTAL SCIENCE & ENGINEERING   01/11/84   STATUS: PRELIMINARY

PROJECT NUMBER 82422420
FIELD GROUP: FRSW2
PARAMETERS: ALL   SAMPLES: ALL

PROJECT NAME FRENCH PHASE 2
PROJECT MANAGER: RICK FOLKEMER
FIELD GROUP LEADER: R.FOLKEMER

SAMPLE NUMBERS

PARAMETERS	STORET #	SW07 299400	SW08 299401	SW09 299402
DATE		11/26/83	11/26/83	11/26/83
TIME		915	915	915
PH,(STD UNITS)	400	5.00	5.00	5.00
SP.COND.,FIELD (UMHOS/CM)	94	120	120	430
CARBON,TOC(MG/L)	680	19.1	28.7	534
TOX (UG/L-CL)	70353	110	77	160
PHENOLS (UG/L)	32730	<1	3	5
ACROLEIN (UG/L)	34210	NA	<10	<50
ACRYLONITRILE (UG/L)	34215	NA	<10	<50
BENZENE (UG/L)	34030	NA	<1	1500
BROMOMETHANE (UG/L)	34413	NA	<3	<15
BROMODICHLOROMETHANE (UG/L)	32101	NA	<2	<10
BROMOFORM (UG/L)	32104	NA	<3	<15
CARBON TETRACHLORIDE (UG/L)	32102	NA	<2	<10
CHLOROBENZENE (UG/L)	34301	NA	<1	<5
CHLOROETHANE (UG/L)	34311	NA	<3	<15
CHLOROFORM (UG/L)	32106	NA	<1	390
CHLOROMETHANE (UG/L)	34418	NA	<2	<10
DIBROMOCHLOROMETHANE (UG/L)	34306	NA	<2	<10
DICHL*DIFLUO*METHANE (UG/L)	34668	NA	<3	<15
1,1-DICHLOROETHANE (UG/L)	34496	NA	<1	210
1,2-DICHLOROETHANE (UG/L)	34531	NA	<2	190

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ENVIRONMENTAL SCIENCE & ENGINEERING 01/11/84 STATUS: PRELIMINARY

PROJECT NUMBER 82422420
FIELD GROUP: FPSW2
PARAMETERS: ALL SAMPLES: ALL

PROJECT NAME FRENCH PHASE 2
PROJECT MANAGER: RICK FOLKERER
FIELD GROUP LEADER: R.FOLKERER

SAMPLE NUMBERS

PARAMETERS	STORET #	SW07 299400	SW08 299401	SW09 299402
DATE		11/26/83	11/26/83	11/26/83
TIME		915	915	915
1,1-DICHLOROETHYLENE (UG/L)	34501	NA	<2	13
T-1,2-DICHLOROETHENE (UG/L)	34546	NA	<2	350
1,2-DICHLOROPROPANE (UG/L)	34541	NA	<1	17
CIS-1,3-DICH*PROPENE (UG/L)	34704	NA	<2	<10
T-1,3-DICHL*PROPENE (UG/L)	34699	NA	<1	<5
ETHYLBENZENE (UG/L)	34371	NA	<2	580
METHYLENE CHLORIDE (UG/L)	34423	NA	<2	<10
1,1,2,2-TE*CH*ETHANE (UG/L)	34516	NA	<1	<5
TETRACHLOROETHENE (UG/L)	34475	NA	<3	63
1,1,1-TRICHL*ETHANE (UG/L)	34506	NA	<2	<10
1,1,2-TRICHL*ETHANE (UG/L)	34511	NA	<2	<10
TRICHLOROETHENE (UG/L)	39180	NA	<2	110
TRICHL*FLUOROMETHANE (UG/L)	34488	NA	<3	<15
TOLUENE (UG/L)	34010	NA	<1	410
VINYL CHLORIDE(UG/L)	39175	NA	<2	180
2-CHL*ETH*VINYLETHER (UG/L)	34576	NA	<2	<10
ACENAPHTHENE (UG/L)	34205	NA	<1	260
ACENAPHTHYLENE(UG/L)	34200	NA	<1	240
ANTHRACENE (UG/L)	34220	NA	<1	220
BENZO(A)ANTHRACENE (UG/L)	34526	NA	<1	280

ENVIRONMENTAL SCIENCE & ENGINEERING 11/11/84

PROJECT NUMBER F242242

FIELD GROUP: FRSW2

PARAMETERS: ALL SAMPLES: ALL

STATUS: PRELIMINARY

PROJECT NAME FRENCH PHASE 2

PROJECT MANAGER: RICK FOLKEMER

FIELD GROUP LEADER: R.FOLKEMER

SAMPLE NUMBERS

PARAMETERS	STORET #	SW07 299400	SW08 299401	SW09 299402
DATE		11/26/83	11/26/83	11/26/83
TIME		915	915	915
BENZO(B)FLUORANTHENE (UG/L)	34230	NA	<1	<4
BENZO(K)FLUORANTHENE (UG/L)	34242	NA	<1	<4
BENZO(A)PYRENE(UG/L)	34247	NA	<1	<5
BENZO(GHI)PERYLENE (UG/L)	34521	NA	<2	<8
BENZIDINE (UG/L)	39120	NA	<2	<9
BIS(2-CHL*ETH*)ETHER (UG/L)	34273	NA	<1	<7
BIS(2-CHL*ETHOX)MTHN (UG/L)	34278	NA	<5	<30
BIS(2-ETH*HEX*)PHTH. (UG/L)	39100	NA	3	390
BIS(2-CHL*ISOPR)ETHR (UG/L)	34283	NA	<5	<30
4-BRO*PHEN*PHEN*ETHR (UG/L)	34636	NA	<6	<39
BUTYL BENZ*PHTHALATE (UG/L)	34292	NA	<1	<5
2-CHLORONAPHTHALENE (UG/L)	34581	NA	<1	<5
4-CHL*PHEN*PHEN*ETHR (UG/L)	34641	NA	<2	<12
CHRYSENE (UG/L)	34320	NA	<1	170
DIBEN*(A,H)ANTH*CENE (UG/L)	34556	NA	<2	<9
DI-N-BUTYLPHTHALATE (UG/L)	39110	NA	2	<2
1,3,DICHLOROBENZENE (UG/L)	34566	NA	<1	<7
1,4-DICHLOROBENZENE (UG/L)	34571	NA	<1	<7
1,2-DICHLOROBENZENE (UG/L)	34536	NA	<2	<8
3,3'-DICHL*BENZIDINE (UG/L)	34631	NA	<2	<11

ENVIRONMENTAL SCIENCE & ENGINEERING 01/11/84

STATUS: PRELIMINARY

PROJECT NUMBER 82423420
FIELD GROUP: FPSW2
PARAMETERS: ALL SAMPLES: ALL

PROJECT NAME FRENCH PHASE 2
PROJECT MANAGER: RICK FOLKERER
FIELD GROUP LEADER: R.FOLKERER

SAMPLE NUMBERS

PARAMETERS	STORET #	SW07 299400	SW08 299401	SW09 299402
DATE		11/26/83	11/26/83	11/26/83
TIME		915	915	915
DIETHYLPHTHALATE (UG/L)	34336	NA	<1	<3
DIMETHYLPTHALATE (UG/L)	34341	NA	<1	<4
2,4-DINITROTOLUENE (UG/L)	34611	NA	<2	<12
2,6-DINITROTOLUENE (UG/L)	34626	NA	<3	<16
DIOCTYLPHTHALATE (UG/L)	34596	NA	<1	<2
1,2-DIPHEN*HYDRAZINE (UG/L)	34346	NA	<1	<3
FLUORANTHENE (UG/L)	34376	NA	<1	630
FLUORENE (UG/L)	34381	NA	<1	570
HEXACHLOROBENZENE (UG/L)	39700	NA	<2	<12
HEXACHLOROBUTADIENE (UG/L)	34391	NA	<3	<18
HEXACHLOROETHANE (UG/L)	34396	NA	<2	<13
HEXACH*CYC*PEN*DIENE (UG/L)	34386	NA	<3	<15
INDENO(1,2,3-CD)PYRN (UG/L)	34403	NA	<1	<7
ISOPHORONE (UG/L)	34408	NA	<1	<4
NAPHTHALENE (UG/L)	34696	NA	<1	720
NITROBENZENE (UG/L)	34447	NA	<1	<7
N-NITROSODIMETHAMINE (UG/L)	34438	NA	<5	<29
N-NITROSODIPRO*AMINE (UG/L)	34428	NA	<5	<30
N-NITROSODIPHE*AMINE (UG/L)	34433	NA	<1	<7
PHENANTHRENE (UG/L)	34461	NA	<1	1300

ENVIRONMENTAL SCIENCE & ENGINEERING 01/11/84

STATUS: PRELIMINARY

PROJECT NUMBER 82422425
FIELD GROUP: FPSW2
PARAMETERS: ALL SAMPLES: ALL

PROJECT NAME FRENCH PHASE 2
PROJECT MANAGER: RICK FOLKEMER
FIELD GROUP LEADER: R.FOLKEMER

SAMPLE NUMBERS

PARAMETERS	STORET #	SW07 299400	SW08 299401	SW09 299402
DATE		11/26/83	11/26/83	11/26/83
TIME		915	915	915
PYRENE (UG/L)	34469	NA	<1	740
2,3,7,8-TCDD(UG/L)	34675	NA	<9	<60
1,2,4-TRICHL*BENZENE (UG/L)	34551	NA	<2	<10
4-CHL*-3-METH*PHENOL (UG/L)	34452	NA	<2	<11
2-CHLOROPHENOL(UG/L)	34586	NA	<2	<8
2,4-DICHLOROPHENOL (UG/L)	34601	NA	<2	<11
2,4-DIMETHYLPHENOL (UG/L)	34606	NA	<2	<9
2,4-DINITROPHENOL (UG/L)	34616	NA	<2	<9
2-MET*-4,6-DN*PHENOL (UG/L)	34657	NA	<4	<25
2-NITROPHENOL (UG/L)	34591	NA	<3	<15
4-NITROPHENOL (UG/L)	34646	NA	<3	<20
PENTACHLOROPHENOL (UG/L)	39032	NA	<5	<29
PHENOL (UG/L)	34694	NA	<1	<7
2,4,6-TRICHL*PHENOL (UG/L)	34621	NA	<2	<14
ALDRIN (UG/L)	39330	NA	<0.004	<0.004
BHC,A (UG/L)	39337	NA	<0.002	<0.002
BHC,B (UG/L)	39338	NA	<0.020	<0.020
BHC,D (UG/L)	39259	NA	<0.004	<0.004
BHC,G(LINDANE)(UG/L)	39340	NA	<0.003	<0.003
CHLORDANE (UG/L)	39350	NA	<0.030	<0.030

ENVIRONMENTAL SCIENCE & ENGINEERING 01/11/84 STATUS: PRELIMINARY

PROJECT NUMBER 82422426
FIELD GROUP: FRSW2
PARAMETERS: ALL SAMPLES: ALL

PROJECT NAME FRENCH PHASE 2
PROJECT MANAGER: RICK FOLKEMER
FIELD GROUP LEADER: R.FOLKEMER

SAMPLE NUMBERS

PARAMETERS	STORET #	SW07 299400	SW08 299401	SW09 299402
DATE		11/26/83	11/26/83	11/26/83
TIME		915	915	915
DDD,PP'(UG/L)	39310	NA	<0.020	<0.020
DDE,PP'(UG/L)	39320	NA	<0.006	<0.006
DDT,PP'(UG/L)	39300	NA	<0.020	<0.020
DIELDRIN (UG/L)	39380	NA	<0.060	<0.060
ENDOSULFAN,A (UG/L)	34361	NA	<0.050	<0.050
ENDOSULFAN,B (UG/L)	34356	NA	<0.050	<0.050
ENDOSULFAN SULFATE (UG/L)	34351	NA	<0.050	<0.050
ENDRIN (UG/L)	39390	NA	<0.010	<0.010
ENDRIN ALDEHYDE (UG/L)	34366	NA	<0.100	<0.100
HEPTACHLOR (UG/L)	39410	NA	<0.004	<0.004
HEPTACHLOR EPOXIDE (UG/L)	39420	NA	<0.040	<0.040
TOXAPHENE (UG/L)	39400	NA	<0.200	<0.200

BOOKMARK

APPENDIX J

Chemical Results--Sediments

ENVIRONMENTAL SCIENCE & ENGINEERING 09/02/83 FIELD GROUP FRSS1 STATUS IS FINAL

PROJECT NUMBER 83801210
SAMPLES: PART
PROJECT MANAGER DAVE MIZELL

PROJECT NAME FRENCH LTD HAZWASTE
PARAMETERS: BNSED
FIELD GROUP LEADER RICKFOLKEMER

PARAMETERS	STORET #	SE01 230000	SE01D 230001	SE03 230003	SE04 230004	SE10 230017
DATE		4/15/83	4/15/83	4/15/83	4/17/83	4/7/83
TIME		1421	1418	1500	940	1100
1,3-DICHLBENZENE,SED UG/KG-DRY	34569	<17000	<6900	<130000	<130	<240
1,4-DICHLBENZENE,SED UG/KG-DRY	34574	<16000	<6500	<130000	<130	<230
1,2-DICHLBENZENE,SED UG/KG-DRY	34539	<17000	<7200	<140000	<140	<250
HEXACHL*ETHANE,SED UG/KG-DRY	34399	<31000	<13000	<250000	<250	<450
BIS(2-CHLETHYL)ETHER SD,UG/KG-D	34276	<16000	<6500	<130000	<130	<230
BIS(2-CHLETHOX)MTHAN SD,UG/KG-D	34281	<72000	<31000	<580000	<580	<1100
BIS(2-CHLISOPR)ETHER SD,UG/KG-D	34286	<72000	<31000	<580000	<580	<1100
1,2-DIPH*HYDRAZ.,SED UG/KG-DRY	34349	<6300	<2700	<50000	<50	<92
N-NITROSODIMETHYLAM, SD,UG/KG-D	34441	<69000	<30000	<550000	<550	<1100
N-NITROSOD-N-PROP,SD UG/KG-DRY	34431	<72000	<31000	<580000	<580	<1100
1,2,4-TRICHL*BENZENE SD,UG/KG-D	34554	<23000	<10000	<180000	<180	<330
HEXACHLBUTADIENE,SED UG/KG-DRY	39705	<43000	<19000	<350000	<350	<640
NAPHTHALENE,SED(UG/KG-DRY)	34445	1300000	280000	2400000	<43	160
ISOPHORONE,SED(UG/KG-DRY)	34411	<8100	<3500	<65000	<65	<120
HEXACHLCYCLOPENT,SED UG/KG-DRY	34389	<34000	<15000	<280000	<280	<500
2-CHLNAPHTHALENE,SED UG/KG-DRY	34584	<11000	<4600	<86000	<86	<160
ACENAPHTHYLENE,SED UG/KG-DRY	34203	240000	62000	340000	<50	730
ACENAPHTHENE,SED UG/KG-DRY	34208	190000	58000	320000	<93	420
2,6-DNT,SED(UG/KG-DRY)	34629	<39000	<17000	<310000	<310	<570
2,4-DNT,SED(UG/KG-DRY)	34614	<27000	<12000	<220000	<220	<400

ENVIRONMENTAL SCIENCE & ENGINEERING 09/02/83 FIELD GROUP FRSS1 STATUS IS FINAL

PROJECT NUMBER 83801210
SAMPLES:
PROJECT MANAGER DAVE MIZELL

PROJECT NAME FRENCH LTD HAZWASTE
FIELD GROUP LEADER RICKFOLKEMER

PARAMETERS	STORET #	SE01 230000	SE01D 230001	SE03 230003	SE04 230004	SE10 230017
				SAMPLE NUMBERS		
DATE		4/15/83	4/15/83	4/15/83	4/17/83	4/7/83
TIME		1421	1418	1500	940	1100
INDENO(1,2,3-CD)PYR, SD,UG/KG-D	34406	<17000	<6900	<130000	<130	<240
DIBENZO(A,H)ANTHRA, SD,UG/KG-D	34559	<21000	<9000	<170000	<170	<310
BENZO(GHI)PERYLENE, SD,UG/KG-D	34524	<17000	<7200	<140000	<140	<250
2,3,7,8-TCDD,SED(UG/ KG-DRY)	34678	<150000	<62000	<1200000	<1200	<2100
FLUORENE,SED(UG/KG- DRY)	34384	280000	[illegible]0000	680000	<86	820
4-CHLPHYLPHENYLETHER SD,UG/KG-D	34644	<29000	<13000	<230000	<230	<430

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ENVIRONMENTAL SCIENCE & ENGINEERING 09/02/83 FIELD GROUP FRSS1 STATUS IS FINAL

PROJECT NUMBER 83801210
SAMPLES:
PROJECT MANAGER DAVE MIZELL

PROJECT NAME FRENCH LTD HAZWASTE
FIELD GROUP LEADER RICKFOLKEMER

PARAMETERS	STORET #	SE01 230000	SE01D 230001	SE03 230003	SE04 230004	SE10 230017
DATE		4/15/83	4/15/83	4/15/83	4/17/83	4/7/83
TIME		1421	1418	1500	940	1100
N-NITROSODIPHENYLAM, SD,UG/KG-D	34436	160000	39000	700000	<130	<240
HEXACLRBENZENE,SED UG/KG-DRY	39701	<29000	<13000	<230000	<230	<430
4-BRPHNL PHNL ETHER SD,UG/KG-D	34639	<93000	<40000	<750000	<750	<1400
DIMETHYL PHTHALATE, SD,UG/KG-D	34344	<9000	<3900	<72000	<72	<140
DIETHYL PHTHALATE, SD,UG/KG-D	34339	<7200	<3100	<58000	<58	<110
DI-N-BUTYL PHTHALATE SD,UG/KG-D	39112	<4500	<2000	<36000	<36	<66
BUTYL BEN,PHTHALATE SD,UG/KG-D	34295	<9900	<4200	<79000	<79	<150
BIS(2-ETHYLHEX)PHTH, SD,UG/KG-D	39102	<7200	<3100	<58000	<58	<110
DI-N-OCTYL PHTHALATE SD,UG/KG-D	34599	16000	13000	<36000	570	<66
PHENANTHRENE,SED(UG/ KG-DRY)	34464	710000	150000	1800000	<72	2100
ANTHRACENE,SED(UG/KG -DRY)	34223	120000	38000	200000	<100	470
FLUORANTHENE,SED(UG/ KG-DRY)	34379	280000	81000	650000	<58	570
PYRENE,SED(UG/KG- DRY)	34472	280000	84000	540000	<58	870
BENZIDINE,SED(UG/KG- DRY)	39121	<21000	<9000	<170000	<170	<310
CHRYSENE,SED(UG/KG- DRY)	34323	63000	22000	98000	<72	190
BENZO(A)ANTHRACENE, SD,UG/KG-D	34529	98000	32000	210000	<130	<240
3,3-DICHLBENZIDINE, SD,UG/KG-D	34634	<25000	<11000	<200000	<200	<370
BENZO(B)FLUORAN,SED(UG/KG-DRY)	34233	52000	17000	97000	<72	<120
BENZO(K)FLUORAN,SED UG/KG-DRY	34245	<10000	<4300	<80000	<72	<120
BENZO(A)PYRENE,SED UG/KG-DRY	34250	52000	13000	<93000	<93	<180

ENVIRONMENTAL SCIENCE & ENGINEERING 08/31/83 FIELD GROUP FRSS1 STATUS IS FINAL

PROJECT NUMBER 83801210
SAMPLES: SED7
PROJECT MANAGER DAVE MIZELL

PROJECT NAME FRENCH LTD HAZWASTE
PARAMETERS: SED6
FIELD GROUP LEADER RICKFOLKEMER

		SAMPLE NUMBERS					
		SE01	SE01D	SE03	SE04	SE06	SE10
PARAMETERS	STORET #	230000	230001	230003	230004	230005	230017
DATE		4/15/83	4/15/83	4/15/83	4/17/83	4/14/83	4/7/83
TIME		1421	1418	1500	940	1100	1100
ARSENIC,SED (MG/KG-DRY)	1003	9.9	6.3	3.5	0.1	1.4	0.9
BERYLLIUM,SED(MG/KG-DRY)	1013	51.6	39.0	13.1	0.5	7.3	6.8
CADMIUM,SED (MG/KG-DRY)	1028	7.6	5.0	4.7	<0.07	0.2	0.3
CHROMIUM,SED (MG/KG-DRY)	1029	486	297	292	1.3	13.0	18.2
COPPER,SED(MG/KG-DRY)	1043	83	85	150	0.7	5	12
MERCURY,SED(MG/KG-DRY)	71921	<0.77	<0.71	<0.50	<0.11	0.26	<0.16
NICKEL,SED (MG/KG-DRY)	1068	592	533	92	0.9	10	15
LEAD,SED (MG/KG-DRY)	1052	120	98.1	101	3.7	21.5	35.1
SELENIUM,SED (MG/KG-DRY)	1148	0.7	0.7	0.6	<0.10	0.2	<0.2
SILVER,SED (MG/KG-DRY)	1078	0.3	0.2	0.1	0.01	0.02	0.02
THALLIUM,SED(MG/KG-DRY)	34480	<75.9	<67.2	<46.6	<12.3	<19.2	<21.2
ZINC,SED (MG/KG-DRY)	1093	8530	6620	1070	6	68	99
ANTIMONY,SED (MG/KG-DRY)	1098	<150	<130	<93	<25	<38	<42

ENVIRONMENTAL SCIENCE & ENGINEERING 08/31/83 FIELD GROUP FRSS1 STATUS IS FINAL

PROJECT NUMBER 83801210
SAMPLES: SEDS
PROJECT MANAGER DAVE MIZELL

PROJECT NAME FRENCH LTD HAZWASTE
PARAMETERS: ACIDSD
FIELD GROUP LEADER RICKFOLKEMER

PARAMETERS	STORET #	SE01 230000	SE01D 230001	SE03 230003	SE04 230004	SE06 230005	SE10 230017
					SAMPLE NUMBERS		
DATE		4/15/83	4/15/83	4/15/83	4/17/83	4/14/83	4/7/83
TIME		1421	1418	1500	940	1100	1100
P-CHLOR-M-CRESOL,SED UG/KG-DRY	34455	<25000	<11000	<200000	<200	<310	<370
2-CHLOROPHENOL,SED, UG/KG-DRY	34589	<18000	<8000	<150000	<150	<230	<270
2,4-DICHL'PHENOL,SED UG/KG-DRY	34604	<26000	<12000	<210000	<210	<330	<390
2,4-DIMET'PHENOL,SED UG/KG-DRY	34609	<20000	<9000	<160000	<160	<250	<290
2,4-DINIT'PHENOL,SED UG/KG-DRY	34619	<21000	<9000	<170000	<170	<260	<310
4,6-DINIT'CRESOL,SED UG/KG-DRY	34660	<59000	<26000	<480000	<480	<740	<870
2-NITROPHENOL,SED(UG /KG-DRY)	34594	<34000	<15000	<280000	<280	<430	<500
4-NITROPHENOL,SED(UG /KG-DRY)	34649	<48000	<21000	<380000	<380	<590	<700
PENTACHLPHENOL,SED UG/KG-DRY	39061	<68000	<30000	<550000	<550	<850	<1100
PHENOL,SED(UG/KG-DRY)	34695	<17000	<7000	<130000	<130	<200	<240
2,4,6-TRICHLPHNL,SED UG/KG-DRY	34624	<34000	<15000	<270000	<270	<410	<490

ENVIRONMENTAL SCIENCE & ENGINEERING 08/31/83 FIELD GROUP FRSS1 STATUS IS FINAL

PROJECT NUMBER 83801210
SAMPLES: SED2
PROJECT MANAGER DAVE MIZELL

PROJECT NAME FRENCH LTD HAZWASTE
PARAMETERS: SED1
FIELD GROUP LEADER RICKFOLKEMER

		SAMPLE NUMBERS									
PARAMETERS	STORET #	SE01 230000	SE01D 230001	SE02 230002	SE03 230003	SE04 230004	SE06 230005	SE07 230006	SE08 230007	SE09 230008	SE05 230015
DATE		4/15/83	4/15/83	4/15/83	4/15/83	4/17/83	4/14/83	4/14/83	4/14/83	4/16/83	4/14/83
TIME		1421	1418	1447	1500	940	1100	1345	1445	1600	1000
SOLIDS (% WET WT)	70318	12.2	14.1	28.2	20.0	82.4	48.1	69.2	46.4	41.4	55.4
CARBON,TOC,SED(G/KG-DRY)	687	383	44.5	38.4	179	1.35	11.0	5.40	11.2	16.2	31.9
TOX,SED(UG/KG-DRY)	99263	633000	535000	239000	241000	7100	36600	8630	49600	21500	38000
PHENOLS,SED(UG/KG-DRY)	32731	31000	24200	7980	22900	<299	2650	<197	NA	NA	1660
TOE,SED(MG/KG-WET)	99121	10200	7880	31400	92600	541	602	209	574	2060	91400

ENVIRONMENTAL SCIENCE & ENGINEERING 08/31/83 FIELD GROUP FRSS1 STATUS IS FINAL

PROJECT NUMBER 83801210
SAMPLES: SED2
PROJECT MANAGER DAVE MIZELL

PROJECT NAME FRENCH LTD HAZWASTE
PARAMETERS: SED1
FIELD GROUP LEADER RICKFOLKEMER

SAMPLE NUMBERS

PARAMETERS	STORET #	SE10 230017
DATE		4/7/83
TIME		1100
SOLIDS (% WET WT)	70318	46.5
CARBON,TOC,SED(G/KG-DRY)	687	14.2
TOX,SED(UG/KG-DRY)	99263	534
PHENOLS,SED(UG/KG-DRY)	32731	<532
TOE,SED(MG/KG-WET)	99121	1380

ENVIRONMENTAL SCIENCE & ENGINEERING -1/11/84 STATUS: PRELIMINARY

PROJECT NUMBER 82422420
FIELD GROUP: FPSF2
PARAMETERS: ALL SAMPLES: ALL

PROJECT NAME FRENCH PHASE 2
PROJECT MANAGER: RICK FOLKEMER
FIELD GROUP LEADER: R.FOLKEMER

PARAMETERS	STORET #	SE11 299300	SE12 299301	SE13 299302	SE14 299303	SE20D 299304	SE15 299305	SE16 299306	SE17 299307	SE18 299308	SE19 299309
DATE		11/21/83	11/21/83	11/21/83	11/21/83	11/30/83	11/25/83	11/25/83	11/25/83	11/25/83	11/25/83
TIME		830	1000	1100	1100	1453	1130	1100	1020	1010	945
TOE,SED(MG/KG-DRY)	99344	4120	14700	1060	1960	314	2660	636	680	1330	921
CARBON,TOC,SED(G/KG-DRY)	687	42.7	22.3	8.44	2.73	20.9	0.35	30.4	36.4	18.5	8.85
TOX,SED(UG/KG-DRY)	99263	14000	6100	2000	1600	1600	1600	5400	17000	2500	1900
SOLIDS (% WET WT)	70318	31.8	37.3	43.5	68.4	55.0	85.6	21.8	18.5	45.4	60.8
ALDRIN,SED(UG/KG-DRY)	39333	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BHC,A,SED(UG/KG-DRY)	39076	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BHC,B,SED(UG/KG-DRY)	34257	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BHC,D,SED(UG/KG-DRY)	34262	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BHC,G(LINDANE)SED UG/KG-DRY	39783	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
CHLORDANE,SED(UG/KG-DRY)	39351	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DDD,PP',SED(UG/KG-DRY)	39311	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DDE,PP',SED (UG/KG-DRY)	39321	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DDT,PP',SED(UG/KG-DRY)	39301	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DIELDRIN,SED(UG/KG-DRY)	39383	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
ENDOSULFAN,A,SED(UG/KG-DRY)	34364	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
ENDOSULFAN,B,SED(UG/KG-DRY)	34359	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
ENDOSULFAN SULF,SED, UG/KG-DRY	34354	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
ENDRIN,SED(UG/KG-DRY)	39393	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
HEPTACHLOR,SED(UG/KG-DRY)	39413	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
HEPTACHLOR EPOX,SED UG/KG-DRY	39423	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

PROJECT NUMBER P2422420
FIELD GROUP: FRSE2
PARAMETERS: ALL SAMPLES: ALL

PROJECT NAME FRENCH PHASE 2
PROJECT MANAGER: RICK FOLKEMER
FIELD GROUP LEADER: R.FOLKEMER

		SAMPLE NUMBERS									
PARAMETERS	STORET #	SE11 299300	SE12 299301	SE13 299302	SE14 299303	SE20D 299304	SE15 299305	SE16 299306	SE17 299307	SE18 299308	SE19 299309
DATE		11/21/83	11/21/83	11/21/83	11/21/83	11/30/83	11/25/83	11/25/83	11/25/83	11/25/83	11/25/83
TIME		830	1000	1100	1100	1453	1130	1100	1020	1010	945
TOXAPHENE,SED(UG/KG-DRY)	39403	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
ENDRIN ALD.,SED(UG/KG-DRY)	34369	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB-1016(UG/KG-D)	39514	9400	24000	250	410	<3.70	<2.50	<92.0	390	62.0	<33.0
PCB-1260(UG/KG-D)	39511	350	94.0	120	<29.0	21.0	<2.5	17.0	42.0	12.0	11.0
ACROLEIN,SED(UG/KG-DRY)	34213	NA	NA	NA	<1000	NA	<1700	<3800	NA	<1500	NA
ACRYLONITRILE,SED(UG/KG-DRY)	34218	NA	NA	NA	<1000	NA	<1700	<3800	NA	<1500	NA
BENZENE,SED(UG/KG-DRY)	34237	NA	NA	NA	270	NA	<31	<67	NA	<27	NA
BROMOMETHANE,SED(UG/KG-DRY)	34416	NA	NA	NA	<110	NA	<190	<400	NA	<160	NA
BROMODICHLOROMETHANE SD,UG/KG-D	34330	NA	NA	NA	<44	NA	<78	<180	NA	<69	NA
BROMOFORM,SED(UG/KG-DRY)	34290	NA	NA	NA	<85	NA	<130	<280	NA	<110	NA
CARBON TETRACHLORIDE SD(UG/KG-D	34299	NA	NA	NA	<110	NA	<180	<390	NA	<150	NA
CHLOROBENZENE,SED(UG/KG-DRY)	34304	NA	NA	NA	<27	NA	<43	<94	NA	<37	NA
CHLOROETHANE,SED(UG/KG-DRY)	34314	NA	NA	NA	<120	NA	<200	<440	NA	<180	NA
2-CHL'ETHYLVINLETHER SD,UG/KG-D	34579	NA	NA	NA	<70	NA	<120	<250	NA	<98	NA
CHLOROFORM,SED(UG/KG-DRY)	34318	NA	NA	NA	<42	NA	<66	<150	NA	<58	NA
CHLOROMETHANE,SED(UG/KG-DRY)	34421	NA	NA	NA	<60	NA	<110	<230	NA	<90	NA
DIBROMOCHLOROMETHANE SD,UG/KG-D	34309	NA	NA	NA	<73	NA	<110	<250	NA	<97	NA
DICHL'DIFLUO'METHANE SD,UG/KG-D	34334	NA	NA	NA	<90	NA	<140	<300	NA	<120	NA
1,1DICHL'ETHANE,SED,UG/KG-DRY	34499	NA	NA	NA	<36	NA	<63	<140	NA	<55	NA
1,2-DICHLOROETHANE,SD,UG/KG-D	34534	NA	NA	NA	<65	NA	<110	<250	NA	<95	NA

ENVIRONMENTAL SCIENCE & ENGINEERING .1/11/84 STATUS: PRELIMINARY

PROJECT NUMBER 82422420
FIELD GROUP: FPSE2
PARAMETERS: ALL SAMPLES: ALL

PROJECT NAME FRENCH PHASE 2
PROJECT MANAGER: RICK FOLKEMER
FIELD GROUP LEADER: R.FOLKEMER

		SAMPLE NUMBERS									
PARAMETERS	STORET #	SE11 299300	SE12 299301	SE13 299302	SE14 299303	SE20D 299304	SE15 299305	SE16 299306	SE17 299307	SE18 299308	SE19 299309
DATE		11/21/83	11/21/83	11/21/83	11/21/83	11/30/83	11/25/83	11/25/83	11/25/83	11/25/83	11/25/83
TIME		830	1000	1100	1100	1453	1130	1100	1020	1010	945
1,1 DICHL'ETHENE,SED UG/KG-DRY	34504	NA	NA	NA	<81	NA	<140	<290	NA	<120	NA
T-1,2-DICHLOROETHENE SD,UG/KG-D	34549	NA	NA	NA	<71	NA	<120	<250	NA	<100	NA
1,2-DICHLOROPROPANE, SD,UG/KG-D	34544	NA	NA	NA	<41	NA	<67	<150	NA	<59	NA
CIS-1,3-DICH'PROPENE SD,UG/KG-D	34702	NA	NA	NA	<63	NA	<100	<230	NA	<89	NA
ETHYLBENZENE,SED(UG/ KG-DRY)	34374	NA	NA	NA	200	NA	<110	<230	NA	<90	NA
METHYLENE CHLOR.,SED UG/KG-DRY	34426	NA	NA	NA	<70	NA	<110	<240	NA	<100	NA
1,1,2,2-TET'CH'ETHAN SD,UG/KG-D	34519	NA	NA	NA	<33	NA	<51	<120	NA	<45	NA
TETCL'ETHLENE,SED UG/KG-DRY	34478	NA	NA	NA	<130	NA	<190	<420	NA	<170	NA
1,1,1-TRICHL'ETHANE, SD,UG/KG-D	34509	NA	NA	NA	<80	NA	<130	<290	NA	<120	NA
1,1,2-TRICHL'ETHANE, SD,UG/KG-D	34514	NA	NA	NA	<67	NA	<110	<230	NA	<91	NA
TRICHLOROETHENE,SED UG/KG-DRY	34487	NA	NA	NA	<77	NA	<120	<260	NA	<110	NA
TRICHLOROFLUOROMETH, SD,UG/KG-D	34491	NA	NA	NA	<90	NA	<140	<300	NA	<120	NA
TOLUENE,SED(UG/KG-DRY)	34483	NA	NA	NA	37	NA	<51	<120	NA	<45	NA
VINYL CHLORIDE,SED UG/KG-DRY	34495	NA	NA	NA	<75	NA	<150	<320	NA	<130	NA
T-1,3-DICH'PROPENE, SD,UG/KG-D	34697	NA	NA	NA	<28	NA	<44	<97	NA	<39	NA
BIS(2-CHLETHYL)ETHER SD,UG/KG-D	34276	NA	<2200	NA	<40	<46	<27	<390	NA	<58	NA
1,3-DICHLBENZENE,SED UG/KG-DRY	34569	NA	<2300	NA	<43	<50	<30	<410	NA	<60	NA
1,4-DICHLBENZENE,SED UG/KG-DRY	34574	NA	<2200	NA	<40	<46	<27	<390	NA	<58	NA
1,2-DICHLBENZENE,SED UG/KG-DRY	34539	NA	<2400	NA	<44	<51	<31	<430	NA	<61	NA
HEXACHL'ETHANE,SED UG/KG-DRY	34399	NA	<4300	NA	<79	<91	<54	<780	NA	<120	NA

ENVIRONMENTAL SCIENCE & ENGINEERING 01/11/84 STATUS: PRELIMINARY

PROJECT NUMBER P2422420
FIELD GROUP: FRSE2
PARAMETERS: ALL SAMPLES: ALL

PROJECT NAME FRENCH PHASE 2
PROJECT MANAGER: RICK FOLKEMER
FIELD GROUP LEADER: R.FOLKEMER

		SAMPLE NUMBERS									
PARAMETERS	STORET #	SE11 299300	SE12 299301	SE13 299302	SE14 299303	SE200 299304	SE15 299305	SE16 299306	SE17 299307	SE18 299308	SE19 299309
DATE		11/21/83	11/21/83	11/21/83	11/21/83	11/30/83	11/25/83	11/25/83	11/25/83	11/25/83	11/25/83
TIME		830	1000	1100	1100	1453	1130	1100	1020	1010	945
BIS(2-CHLETHOX)MTHAN SD,UG/KG-D	34281	NA	<11000	NA	<200	<220	<130	<1900	NA	<270	NA
BIS(2-CHLISOPR)ETHER SD,UG/KG-D	34286	NA	<11000	NA	<200	<220	<130	<1900	NA	<270	NA
NITROBENZENE,SED(UG/ KG-DRY)	34450	NA	<2200	NA	<40	<46	<27	<390	NA	<58	NA
1,2-DIPH*HYDRAZ.,SED UG/KG-DRY	34349	NA	<890	NA	<17	<17	<12	<170	NA	<25	NA
N-NITROSODIMETHYLAM, SD,UG/KG-D	34441	NA	<9700	NA	<200	<220	<130	<1800	NA	<270	NA
N-NITROSOD-N-PROP,SD UG/KG-DRY	34431	NA	<11000	NA	<200	<220	<130	<1900	NA	<270	NA
1,2,4-TRICHL*BENZENE SD,UG/KG-D	34554	NA	<3300	NA	<59	<68	<40	<600	NA	<84	NA
HEXACHLBUTADIENE,SED UG/KG-DRY	39705	NA	<6200	NA	<120	<130	<76	<1100	NA	<160	NA
NAPHTHALENE,SED(UG/ KG-DRY)	34445	NA	160000	NA	480	<17	22	<140	NA	<20	NA
ISOPHORONE,SED(UG/KG -DRY)	34411	NA	<1200	NA	<22	<26	<16	<210	NA	<31	NA
HEXACHLCYCLOPENT,SED UG/KG-DRY	34389	NA	<4900	NA	<88	<110	<60	<880	NA	<130	NA
2-CHLNAPHTHALENE,SED UG/KG-DRY	34584	NA	<1600	NA	<28	<33	<20	<270	NA	<40	NA
ACENAPHTHYLENE,SED UG/KG-DRY	34203	NA	17000	NA	140	<20	<12	<160	NA	<25	NA
ACENAPHTHENE,SED UG/KG-DRY	34208	NA	27000	NA	190	<37	<22	<300	NA	<45	NA
2,6-DNT,SED(UG/KG-DRY)	34629	NA	<5400	NA	<100	<120	<68.0	<970	NA	<140	NA
2,4-DNT,SED(UG/KG-DRY)	34614	NA	<3800	NA	<69	<82	<48	<690	NA	<100	NA
N-NITROSODIPHENYLAM, SD,UG/KG-D	34436	NA	<2300	NA	290	<50	<30	<410	NA	<60	NA
HEXACLBEENZENE,SED UG/KG-DRY	39701	NA	<4100	NA	<74	<86	<51	<740	NA	<110	NA
4-BRPHNL PHNL ETHER SD,UG/KG-D	34636	NA	<14000	NA	<250	<300	<170	<2400	NA	<350	NA
DIMETHYL PHTHALATE, SD,UG/KG-D	34344	NA	<1300	NA	<24	<20	<17	<23	NA	<34	NA

ENVIRONMENTAL SCIENCE & ENGINEERING 01/11/84 STATUS: PRELIMINARY

PROJECT NUMBER 82422420
FIELD GROUP: FRSE2
PARAMETERS: ALL SAMPLES: ALL

PROJECT NAME FRENCH PHASE 2
PROJECT MANAGER: RICK FOLKEMER
FIELD GROUP LEADER: R.FOLKEMER

		SAMPLE NUMBERS									
PARAMETERS	STORET #	SE11 299300	SE12 299301	SE13 299302	SE14 299303	SE20D 299304	SE15 299305	SE16 299306	SE17 299307	SE18 299308	SE19 299309
DATE		11/21/83	11/21/83	11/21/83	11/21/83	11/30/83	11/25/83	11/25/83	11/25/83	11/25/83	11/25/83
TIME		830	1000	1100	1100	1453	1130	1100	1020	1010	945
DIETHYL PHTHALATE, SD,UG/KG-D	34339	NA	<1100	NA	<20	<22	<13	<190	NA	<27	NA
DI-N-BUTYL PHTHALATE SD,UG/KG-D	39112	NA	<650	NA	<12	180	34	<120	NA	<18	NA
BUTYL BEN.PHTHALATE SD,UG/KG-D	34295	NA	<1400	NA	<27	<31	<18	<250	NA	<38	NA
BIS(2-ETHYLHEX)PHTH, SD,UG/KG-D	39102	NA	<1100	NA	8900	440	810	830	NA	<27	NA
DI-N-OCTYL PHTHALATE SD,UG/KG-D	34599	NA	<650	NA	<12	490	<9	<120	NA	<18	NA
PHENANTHRENE,SED(UG/KG-DRY)	34464	NA	91000	NA	510	<28	<17	<250	NA	<34	NA
ANTHRACENE,SED(UG/KG-DRY)	34223	NA	9400	NA	94	65	<16	<210	NA	<31	NA
FLUORANTHENE,SED(UG/KG-DRY)	34379	NA	21000	NA	480	25	<13	<190	NA	88	NA
PYRENE,SED(UG/KG-DRY)	34472	NA	18000	NA	450	29	<13	<190	NA	100	NA
BENZIDINE,SED(UG/KG-DRY)	39121	NA	<3000	NA	<53	<62	<37	<550	NA	<78	NA
CHRYSENE,SED(UG/KG-DRY)	34323	NA	2500	NA	70	150	<16	<210	NA	<31	NA
BENZO(A)ANTHRACENE, SD,UG/KG-D	34529	NA	4800	NA	260	<50	<30	<410	NA	<60	NA
3,3-DICHLBENZIDINE, SD,UG/KG-D	34634	NA	<3500	NA	<65	<77	<45	<650	NA	<93	NA
BENZO(B)FLUORAN,SED(UG/KG-DRY)	34233	NA	<1200	NA	200	<26	<16	<210	NA	<31	NA
BENZO(K)FLUORAN,SED UG/KG-DRY	34245	NA	<1200	NA	<22	<26	<16	<210	NA	<31	NA
BENZO(A)PYRENE,SED UG/KG-DRY	34250	NA	<1700	NA	<31	<37	<22	<300	NA	<45	NA
INDENO(1,2,3-CD)PYR, SD,UG/KG-D	34406	NA	<2300	NA	<43	<50	<30	<410	NA	<60	NA
DIBENZO(A,H)ANTHRA, SD,UG/KG-D	34559	NA	<3000	NA	<53	<62	<37	<550	NA	<78	NA
BENZO(GHI)PERYLENE, SD,UG/KG-D	34524	NA	<2400	NA	<44	<51	<31	<430	NA	<64	NA
2,3,7,8-TCDD,SED(UG/KG-DRY)	34678	NA	<21000	NA	<370	<440	<260	<3700	NA	<530	NA

PROJECT NUMBER F2422426
FIELD GROUP: FRSE2
PARAMETERS: ALL SAMPLES: ALL

PROJECT NAME FRENCH PHASE 2
PROJECT MANAGER: RICK FOLKEMER
FIELD GROUP LEADER: R.FOLKEMER

		SAMPLE NUMBERS									
PARAMETERS	STORET #	SE11 299300	SE12 299301	SE13 299302	SE14 299303	SE20D 299304	SE15 299305	SE16 299306	SE17 299307	SE18 299308	SE19 299309
DATE		11/21/83	11/21/83	11/21/83	11/21/83	11/30/83	11/25/83	11/25/83	11/25/83	11/25/83	11/25/83
TIME		830	1000	1100	1100	1453	1130	1100	1020	1010	945
FLUORENE,SED(UG/KG-DRY)	34384	NA	59000	NA	250	<33	<20	<27.0	NA	<40	NA
4-CHLPHYLPHENYLETHER SD,UG/KG-D	34644	NA	<4100	NA	<74	<88	<51	<740	NA	<110	NA
P-CHLOR-M-CRESOL,SED UG/KG-DRY	34455	NA	NA	NA	NA	NA	<45	NA	NA	<93	NA
2-CHLOROPHENOL,SED, UG/KG-DRY	34589	NA	NA	NA	NA	NA	<32	NA	NA	<67	NA
2,4-DICHL*PHENOL,SED UG/KG-DRY	34604	NA	NA	NA	NA	NA	<46	NA	NA	<97	NA
2,4-DIMET*PHENOL,SED UG/KG-DRY	34609	NA	NA	NA	NA	NA	<36	NA	NA	<73	NA
2,4-DINIT*PHENOL,SED UG/KG-DRY	34619	NA	NA	NA	NA	NA	<37	NA	NA	<78	NA
4,6-DINIT*CRESOL,SED UG/KG-DRY	34660	NA	NA	NA	NA	NA	<110	NA	NA	<220	NA
2-NITROPHENOL,SED(UG/KG-DRY)	34594	NA	NA	NA	NA	NA	<60	NA	NA	<130	NA
4-NITROPHENOL,SED(UG/KG-DRY)	34649	NA	NA	NA	NA	NA	<83	NA	NA	<180	NA
PENTACHLPHENOL,SED UG/KG-DRY	39061	NA	NA	NA	NA	NA	<130	NA	NA	<270	NA
PHENOL,SED(UG/KG-DRY)	34695	NA	NA	NA	NA	NA	85	NA	NA	<60	NA
2,4,6-TRICHLPHNL,SED UG/KG-DRY	34624	NA	NA	NA	NA	NA	<59	NA	NA	<130	NA

ENVIRONMENTAL SCIENCE & ENGINEERING 1/11/84 STATUS: PRELIMINARY

PROJECT NUMBER F2422420
FIELD GROUP: FFSE2
PARAMETERS: ALL SAMPLES: ALL

PROJECT NAME FRENCH PHASE 2
PROJECT MANAGER: RICK FOLKEMER
FIELD GROUP LEADER: R.FOLKEMER

		SAMPLE NUMBERS									
PARAMETERS	STORET #	SE20 299310	SE21 299311	SE22 299312	SE23 299313	SE24 299314	SE25 299315	SE26 299316	SE27 299317	SE28 299318	SE29 299319
DATE		11/30/83	11/30/83	11/20/83	11/25/83	11/25/83	11/24/83	11/24/83	11/27/83	11/27/83	11/20/83
TIME		1453	1700	1045	1415	1440	1045	1145	1440	1400	1445
TOE,SED(MG/KG-DRY)	99344	568	410	<242	824	1310	30300	68900	341	1130	594
CARBON,TOC,SED(G/KG-DRY)	687	14.2	13.3	13.0	4.74	4.70	115	66.6	11.8	8.24	21.4
TOX,SED(UG/KG-DRY)	99263	2000	750	910	840	770	170000	51000	2500	7300	2800
SOLIDS (% WET WT)	70318	54.4	54.1	38.7	58.0	62.4	24.2	38.1	44.0	53.7	24.3
ALDRIN,SED(UG/KG-DRY)	39333	NA	NA	<25.0	NA	NA	<39.0	<25.0	NA	NA	NA
BHC,A,SED(UG/KG-DRY)	39076	NA	NA	<17.0	NA	NA	<26.0	<17.0	NA	NA	NA
BHC,B,SED(UG/KG-DRY)	34257	NA	NA	<22.0	NA	NA	<36.0	<23.0	NA	NA	NA
BHC,D,SED(UG/KG-DRY)	34262	NA	NA	<41.0	NA	NA	<65.0	<41.0	NA	NA	NA
BHC,G(LINDANE)SED UG/KG-DRY	39783	NA	NA	<22	NA	NA	<36	<23	NA	NA	NA
CHLORDANE,SED(UG/KG-DRY)	39351	NA	NA	<330	NA	NA	<530	<340	NA	NA	NA
DDD,PP',SED(UG/KG-DRY)	39311	NA	NA	<82	NA	NA	<130	<83	NA	NA	NA
DDE,PP',SED (UG/KG-DRY)	39321	NA	NA	<40	NA	NA	<64	<41	NA	NA	NA
DDT,PP',SED(UG/KG-DRY)	39301	NA	NA	<290	NA	NA	<460	<290	NA	NA	NA
DIELDRIN,SED(UG/KG-DRY)	39383	NA	NA	<49	NA	NA	<79	<50	NA	NA	NA
ENDOSULFAN,A,SED(UG/KG-DRY)	34364	NA	NA	<44	NA	NA	<71	<45	NA	NA	NA
ENDOSULFAN,B,SED(UG/KG-DRY)	34359	NA	NA	<75	NA	NA	<120	<76	NA	NA	NA
ENDOSULFAN SULF,SED,UG/KG-DRY	34354	NA	NA	<460	NA	NA	<740	<470	NA	NA	NA
ENDRIN,SED(UG/KG-DRY)	39393	NA	NA	<90	NA	NA	<140	<92	NA	NA	NA
HEPTACHLOR,SED(UG/KG-DRY)	39413	NA	NA	<29	NA	NA	<46	<29	NA	NA	NA
HEPTACHLOR EPOX,SED UG/KG-DRY	39423	NA	NA	<30	NA	NA	<48	<31	NA	NA	NA

ENVIRONMENTAL SCIENCE & ENGINEERING 01/11/84 STATUS: PRELIMINARY

PROJECT NUMBER P2422421
FIELD GROUP: FRSE2
PARAMETERS: ALL SAMPLES: ALL

PROJECT NAME FRENCH PHASE 2
PROJECT MANAGER: RICK FOLKEMER
FIELD GROUP LEADER: R.FOLKEMER

		SAMPLE NUMBERS								
PARAMETERS	STORET #	SE20 299310	SE21 299311	SE22 299312	SE23 299313	SE24 299314	SE25 299315	SE26 299316	SE27 299317	SE28 299318	SE29 299319
DATE		11/30/83	11/30/83	11/20/83	11/25/83	11/25/83	11/24/83	11/24/83	11/27/83	11/27/83	11/20/83
TIME		1453	1700	1045	1415	1440	1045	1145	1440	1400	1445
TOXAPHENE,SED(UG/KG-DRY)	39403	NA	NA	<2300	NA	NA	<3600	<2300	NA	NA	NA
ENDRIN ALD.,SED(UG/KG-DRY)	34369	NA	NA	<96	NA	NA	<154	<98	NA	NA	NA
PCB-1016(UG/KG-D)	39514	<3.70	<3.70	NA	<3.40	300	NA	NA	<45.0	120	<82.0
PCB-1260(UG/KG-D)	39511	16.0	24.0	NA	8.0	22.0	NA	NA	460	21.0	7.0
ACROLEIN,SED(UG/KG-DRY)	34213	NA	NA	<1900	<670	NA	<150000	<27000	NA	NA	<1800
ACRYLONITRILE,SED(UG/KG-DRY)	34218	NA	NA	<1900	<670	NA	<150000	<27000	NA	NA	<1800
BENZENE,SED(UG/KG-DRY)	34237	NA	NA	45	<10	NA	270000	120000	NA	NA	<27
BROMOMETHANE,SED(UG/KG-DRY)	34416	NA	NA	<160	<56	NA	<15000	<2200	NA	NA	<150
BROMODICHLOROMETHANE SD,UG/KG-D	34330	NA	NA	<65	<23	NA	<6400	<890	NA	NA	<61
BROMOFORM,SED(UG/KG-DRY)	34290	NA	NA	<140	<47	NA	<12000	<1900	NA	NA	<130
CARBON TETRACHLORIDE SD(UG/KG-D	34299	NA	NA	<150	<51	NA	<11000	<2000	NA	NA	<140
CHLOROBENZENE,SED(UG/KG-DRY)	34304	NA	NA	<40	<14	NA	<4100	3000	NA	NA	<37
CHLOROETHANE,SED(UG/KG-DRY)	34314	NA	NA	<180	<63	NA	<15000	<2500	NA	NA	<170
2-CHL*ETHYLVINLETHER SD,UG/KG-D	34579	NA	NA	<110	<39	NA	<9500	<1600	NA	NA	<110
CHLOROFORM,SED(UG/KG-DRY)	34318	NA	NA	<62	<22	NA	230000	55000	NA	NA	<58
CHLOROMETHANE,SED(UG/KG-DRY)	34421	NA	NA	<97	<34	NA	<9000	<1400	NA	NA	<92
DIBROMOCHLOROMETHANE SD,UG/KG-D	34319	NA	NA	<110	<38	NA	<11000	<1500	NA	NA	<110
DICHL*DIFLUO*METHANE SD,UG/KG-D	34334	NA	NA	<160	<54	NA	<12000	<2200	NA	NA	<150
1,1DICHL*ETHANE,SED,UG/KG-DRY	34499	NA	NA	<52	<18	NA	39000	150000	NA	NA	<49
1,2-DICHLOROETHANE,SD,UG/KG-D	34534	NA	NA	<100	<35	NA	230000	340000	NA	NA	<95

ENVIRONMENTAL SCIENCE & ENGINEERING   01/11/84   STATUS: PRELIMINARY

PROJECT NUMBER 82422420
FIELD GROUP: FRSE2
PARAMETERS: ALL   SAMPLES: ALL

PROJECT NAME FRENCH PHASE 2
PROJECT MANAGER: RICK FOLKEMER
FIELD GROUP LEADER: R.FOLKEMER

		SAMPLE NUMBERS									
PARAMETERS	STORET #	SE20 299310	SE21 299311	SE22 299312	SE23 299313	SE24 299314	SE25 299315	SE26 299316	SE27 299317	SE28 299318	SE29 299319
DATE		11/30/83	11/30/83	11/20/83	11/25/83	11/25/83	11/24/83	11/24/83	11/27/83	11/27/83	11/20/83
TIME		1453	1700	1045	1415	1440	1045	1145	1440	1400	1445
1,1 DICHL*ETHENE,SED UG/KG-DRY	34504	NA	NA	<120	<41	NA	<11000	1800	NA	NA	<110
T-1,2-DICHLOROETHENE SD,UG/KG-D	34549	NA	NA	<110	<37	NA	77000	200000	NA	NA	<100
1,2-DICHLOROPROPANE, SD,UG/KG-D	34544	NA	NA	<65	<23	NA	<5300	100000	NA	NA	<61
CIS-1,3-DICH*PROPENE SD,UG/KG-D	34702	NA	NA	<110	<36	NA	<8300	<1400	NA	NA	<96
ETHYLBENZENE,SED(UG/ KG-DRY)	34374	NA	NA	<87	<31	NA	87000	39000	NA	NA	<82
METHYLENE CHLOR.,SED UG/KG-DRY	34426	NA	NA	<110	9400	NA	<8800	170000	NA	NA	<97
1,1,2,2-TET*CH*ETHAN SD,UG/KG-D	34519	NA	NA	<56	<20	NA	<5600	<770	NA	NA	<53
TETCL*ETHLENE,SED UG/KG-DRY	34478	NA	NA	<180	<61	NA	120000	6000	NA	NA	<170
1,1,1-TRICHL*ETHANE, SD,UG/KG-D	34509	NA	NA	<110	<39	NA	<11000	<1500	NA	NA	<110
1,1,2-TRICHL*ETHANE, SD,UG/KG-D	34514	NA	NA	<120	<40	NA	<11000	55000	NA	NA	<110
TRICHLOROETHENE,SED UG/KG-DRY	34487	NA	NA	<120	<39	NA	48000	16000	NA	NA	<110
TRICHLOROFLUOROMETH, SD,UG/KG-D	34491	NA	NA	<160	<54	NA	<12000	<2200	NA	NA	<150
TOLUENE,SED(UG/KG- DRY)	34483	NA	NA	<47	<17	NA	170000	87000	NA	NA	<44
VINYL CHLORIDE,SED UG/KG-DRY	34495	NA	NA	<120	<40	NA	13000	69000	NA	NA	<110
T-1,3-DICH*PROPENE, SD,UG/KG-D	34697	NA	NA	<44	<16	NA	<3500	2700	NA	NA	<42
BIS(2-CHLETHYL)ETHER SD,UG/KG-D	34276	<48	NA	<130	<350	NA	<13000	<3700	<300	<250	<660
1,3-DICHLBENZENE,SED UG/KG-DRY	34569	<52	NA	<130	<370	NA	<14000	<4000	<320	<250	<700
1,4-DICHLBENZENE,SED UG/KG-DRY	34574	<48	NA	<130	<350	NA	<13000	<3700	<300	<250	<650
1,2-DICHLBENZENE,SED UG/KG-DRY	34539	<54	NA	<140	<380	NA	<1500	<4000	<350	<250	<740
HEXACHL*ETHANE,SED UG/KG-DRY	34399	<96	NA	<250	<680	NA	<26000	<7100	<590	<470	<14[illegible]

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PROJECT NUMBER F2422420
FIELD GROUP: FRSE2
PARAMETERS: ALL SAMPLES: ALL

PROJECT NAME FRENCH PHASE 2
PROJECT MANAGER: RICK FOLKEMER
FIELD GROUP LEADER: R.FOLKEMER

PARAMETERS	STORET #	SE20 299310	SE21 299311	SE22 299312	SE23 299313	SE24 299314	SE25 299315	SE26 299316	SE27 299317	SE28 299318	SE29 299319
DATE		11/30/83	11/30/83	11/20/83	11/25/83	11/25/83	11/24/83	11/24/83	11/27/83	11/27/83	11/20/83
TIME		1453	1700	1045	1415	1440	1045	1145	1440	1400	1445
BIS(2-CHLETHOX)MTHAN SD,UG/KG-D	34281	<240	NA	<570	<1600	NA	<62000	<17000	<1400	<1100	<3100
BIS(2-CHLISOPR)ETHER SD,UG/KG-D	34286	<240	NA	<570	<1600	NA	<62000	<17000	<1400	<1100	<3100
NITROBENZENE,SED(UG/KG-DRY)	34450	<48	NA	<130	<350	NA	<13000	<3700	<300	<250	<660
1,2-DIPH*HYDRAZ.,SED UG/KG-DRY	34349	<21	NA	<52	<140	NA	<5400	<1500	<130	<97	<280
N-NITROSODIMETHYLAM, SD,UG/KG-D	34441	<230	NA	<570	<1600	NA	<58000	<17000	<1400	<1100	<3000
N-NITROSOD-N-PROP,SD UG/KG-DRY	34431	<240	NA	<570	<1600	NA	<62000	<17000	<1400	<1100	<3100
1,2,4-TRICHL*BENZENE SD,UG/KG-D	34554	<70	NA	<180	<500	NA	<19000	<5300	<440	<360	<990
HEXACHLBUTADIENE,SED UG/KG-DRY	39705	<140	NA	<370	<950	NA	<36000	<10000	<850	<680	<1900
NAPHTHALENE,SED(UG/KG-DRY)	34445	<19	NA	120	<120	NA	8700000	1700000	<110	<84	<240
ISOPHORONE,SED(UG/KG-DRY)	34411	<26	NA	<65	<190	NA	<7100	<1900	<160	<130	<350
HEXACHLCYCLOPENT,SED UG/KG-DRY	34389	<110	NA	<290	<760	NA	<29000	<8200	<660	<530	<1500
2-CHLNAPHTHALENE,SED UG/KG-DRY	34584	<35	NA	<86	<250	NA	<9100	<2500	<210	<170	<500
ACENAPHTHYLENE,SED UG/KG-DRY	34203	42	NA	<52	<140	NA	2000000	250000	<130	<97	<250
ACENAPHTHENE,SED UG/KG-DRY	34208	<37	NA	<94	<260	NA	4100000	170000	<230	<180	<540
2,6-DNT,SED(UG/KG-DRY)	34629	<120	NA	<310	<870	NA	<32000	<9000	<750	<600	<1700
2,4-DNT,SED(UG/KG-DRY)	34611	<85	NA	<220	<610	NA	<23000	<5300	<530	<430	<1200
N-NITROSODIPHENYLAM, SD,UG/KG-D	34436	<52	NA	<130	<370	NA	<14000	150000	<320	<250	<700
HEXACLRBENZENE,SED UG/KG-DRY	39701	<91	NA	<230	<640	NA	<24000	<6900	<570	<450	<1300
4-BRPHNL PHNL ETHER SD,UG/KG-D	34639	<300	NA	<750	<2100	NA	<79000	<22000	<1800	<1500	<4100
DIMETHYL PHTHALATE, SD,UG/KG-D	34344	<30	NA	<73	<210	NA	<7500	<2100	<180	<140	<390

ENVIRONMENTAL SCIENCE & ENGINEERING 1/11/84 STATUS: PRELIMINARY

PROJECT NUMBER 82422420
FIELD GROUP: FRSE2
PARAMETERS: ALL SAMPLES: ALL

PROJECT NAME FRENCH PHASE 2
PROJECT MANAGER: RICK FOLKEMER
FIELD GROUP LEADER: R.FOLKEMER

PARAMETERS	STORET #	SE20 299310	SE21 299311	SE22 299312	SE23 299313	SE24 299314	SE25 299315	SE26 299316	SE27 299317	SE28 299318	SE29 299319
DATE		11/30/83	11/30/83	11/20/83	11/25/83	11/25/83	11/24/83	11/24/83	11/27/83	11/27/83	11/20/83
TIME		1453	1700	1045	1415	1440	1045	1145	1440	1400	1445
DIETHYL PHTHALATE, SD,UG/KG-D	34339	59	NA	<57	<160	NA	<6200	<1700	<140	<110	910
DI-N-BUTYL PHTHALATE SD,UG/KG-D	39112	<15	NA	<37	<99	NA	<3800	<1100	<87	<69	820
BUTYL BEN.PHTHALATE SD,UG/KG-D	34295	<32	NA	<81	<230	NA	<8300	<2300	<190	<150	<460
BIS(2-ETHYLHEX)PHTH, SD,UG/KG-D	39102	17000	NA	23000	2600	NA	<6200	45000	320	9500	788
DI-N-OCTYL PHTHALATE SD,UG/KG-D	34599	15000	NA	21000	<540	NA	<3800	<1100	<87	<69	<200
PHENANTHRENE,SED(UG/KG-DRY)	34464	<30	NA	<73	<210	NA	8300000	630000	<180	<140	<390
ANTHRACENE,SED(UG/KG-DRY)	34223	<26	NA	<65	<190	NA	2200000	160000	<160	<130	<350
FLUORANTHENE,SED(UG/KG-DRY)	34379	<24	NA	59	<160	NA	3000000	170000	<140	<110	<310
PYRENE,SED(UG/KG-DRY)	34472	<24	NA	78	<160	NA	2500000	190000	<140	<110	<310
BENZIDINE,SED(UG/KG-DRY)	39121	<65	NA	<170	<470	NA	<18000	<5000	<410	<230	<910
CHRYSENE,SED(UG/KG-DRY)	34323	<26	NA	<65	<190	NA	790000	60000	<160	<130	<350
BENZO(A)ANTHRACENE, SD,UG/KG-D	34529	<52	NA	<130	<370	NA	740000	63000	<320	<260	<700
3,3-DICHLBENZIDINE, SD,UG/KG-D	34634	<80	NA	<200	<560	NA	<21000	<6100	<500	<400	<1200
BENZO(B)FLUORAN,SED(UG/KG-DRY)	34233	<26	NA	<65	<190	NA	700000	45000	<160	<130	<350
BENZO(K)FLUORAN,SED UG/KG-DRY	34245	<26	NA	<65	<190	NA	<7100	<1900	<160	<130	<350
BENZO(A)PYRENE,SED UG/KG-DRY	34250	<37	NA	<94	<260	NA	450000	<2900	<230	<180	<540
INDENO(1,2,3-CD)PYR, SD,UG/KG-D	34406	<52	NA	<130	<370	NA	110000	<4000	<320	<260	<700
DIBENZO(A,H)ANTHR A, SD,UG/KG-D	34559	<65	NA	<170	<470	NA	<19000	<5000	<410	<320	<910
BENZO(GHI)PERYLENE, SD,UG/KG-D	34524	<54	NA	<140	<380	NA	74000	<4000	<340	<180	<740
2,3,7,8-TCDD,SED(UG/KG-DRY)	34675	<460	NA	<1200	<330)	NA	<120000	<35000	<3000	<230	<6200

ENVIRONMENTAL SCIENCE & ENGINEERING 1/11/84 STATUS: PRELIMINARY

PROJECT NUMBER #2422421
FIELD GROUP: FRSED
PARAMETERS: ALL SAMPLES: ALL

PROJECT NAME FRENCH PHASE 2
PROJECT MANAGER: RICK FOLKEMER
FIELD GROUP LEADER: R.FOLKEMER

SAMPLE NUMBERS

PARAMETERS	STORET #	SE20 299310	SE21 299311	SE22 299312	SE23 299313	SE24 299314	SE25 299315	SE26 299316	SE27 299317	SE28 299318	SE29 299319
DATE		11/30/83	11/30/83	11/20/83	11/25/83	11/25/83	11/24/83	11/24/83	11/27/83	11/27/83	11/20/83
TIME		1453	1700	1045	1415	1440	1045	1145	1440	1400	1445
FLUORENE,SED(UG/KG-DRY)	34384	<35	NA	<86	<250	NA	5400000	400000	<210.	<170	<500
4-CHLPHYLPHENYLETHER SD,UG/KG-D	34644	<91	NA	<230	<640	NA	<24000	<6900	<570	<450	<1300
P-CHLOR-M-CRESOL,SED UG/KG-DRY	34455	NA	NA	<200	<560	NA	<21000	<6100	NA	NA	NA
2-CHLOROPHENOL,SED, UG/KG-DRY	34589	NA	NA	<150	<400	NA	<15000	<4200	NA	NA	NA
2,4-DICHL*PHENOL,SED UG/KG-DRY	34604	NA	NA	<210	<590	NA	<22000	<6100	NA	NA	NA
2,4-DIMET*PHENOL,SED UG/KG-DRY	34609	NA	NA	<160	<450	NA	83000	<4800	NA	NA	NA
2,4-DINIT*PHENOL,SED UG/KG-DRY	34619	NA	NA	<170	<470	NA	<18000	<5000	NA	NA	NA
4,6-DINIT*CRESOL,SED UG/KG-DRY	34660	NA	NA	<490	<1400	NA	<50000	<14000	NA	NA	NA
2-NITROPHENOL,SED(UG/KG-DRY)	34594	NA	NA	<290	<760	NA	<29000	<8200	NA	NA	NA
4-NITROPHENOL,SED(UG/KG-DRY)	34649	NA	NA	<390	<1100	NA	<40000	<12000	NA	NA	NA
PENTACHLPHENOL,SED UG/KG-DRY	39061	NA	NA	<550	<1500	NA	740000	29000	NA	NA	NA
PHENOL,SED(UG/KG-DRY)	34695	NA	NA	<130	<370	NA	170000	55000	NA	NA	NA
2,4,6-TRICHLPHNL,SED UG/KG-DRY	34624	NA	NA	<290	<750	NA	<28000	<7900	NA	NA	NA

BOOKMARK

APPENDIX K

Chemical Results--Soils

ENVIRONMENTAL SCIENCE & ENGINEERING 08/31/83 FIELD GROUP FRSS1 STATUS IS FINAL

PROJECT NUMBER 83801210
SAMPLES: SEDIC
PROJECT MANAGER DAVE MIZELL

PROJECT NAME FRENCH LTD HAZWASTE
PARAMETERS: PPSED
FIELD GROUP LEADER RICKFOLKEMER

PARAMETERS	STORET #	S001 230009	S004 230012	S005 230013	S006 230014	S006D 230015
DATE		4/14/83	4/14/83	4/14/83	4/16/83	4/16/83
TIME		1245	930	1415	1500	1500
BHC,G(LINDANE)SED UG/KG-DRY	39783	<180	<180	<180	<180	<180
BHC,D,SED(UG/KG-DRY)	34262	<296	<296	<296	<296	<296
HEPTACHLOR,SED(UG/KG -DRY)	39413	<210	<210	<210	<210	<210
ALDRIN,SED(UG/KG-DRY)	39333	<215	<215	<215	<215	<215
HEPTACHLOR EPO.,SED UG/KG-DRY	39423	<390	<390	<390	<390	<390
ENDOSULFAN,A,SED(UG/KG-DRY)	34364	<520	<520	<520	<520	<520
DIELDRIN,SED(UG/KG-DRY)	39383	<580	<580	<580	<580	<580
DDE,PP',SED (UG/KG-DRY)	39321	<610	<610	<610	<610	<610
ENDRIN,SED(UG/KG-DRY)	39393	<1500	<1500	<1500	<1500	<1500
ENDOSULFAN,B,SED(UG/KG-DRY)	34359	<730	<730	<730	<730	<730
DDD,PP',SED(UG/KG-DRY)	39311	<730	<730	<730	<730	<730
DDT,PP',SED(UG/KG-DRY)	39301	<1700	<1700	<1700	<1700	<1700
CHLORDANE,SED(UG/KG-DRY)	39351	<5700	<5700	<5700	<5700	<5700
TOXAPHENE,SED(UG/KG-DRY)	39403	<19000	<19000	<19000	<19000	<19000
PCBS,SED(UG/KG-DRY)	39519	209000	237000	<9550	<9550	<9550
ENDOSULFAN SULF,SED, UG/KG-DRY	34354	<2400	<2400	<2400	<2400	<2400
ENDRIN ALD.,SED(UG/KG-DRY)	34369	<3750	<3750	<3750	<3750	<3750

ENVIRONMENTAL SCIENCE & ENGINEERING   08/31/83   FIELD GROUP FRSS1 STATUS IS FINAL

PROJECT NUMBER 83801210
SAMPLES: PART
PROJECT MANAGER DAVE MIZELL

PROJECT NAME FRENCH LTD HAZWASTE
PARAMETERS: SED6
FIELD GROUP LEADER RICKFOLKEMER

SAMPLE NUMBERS

PARAMETERS	STORET #	S001 230009
DATE		4/14/83
TIME		1245
ARSENIC,SED (MG/KG-DRY)	1003	2.4
BERYLLIUM,SED(MG/KG-DRY)	1013	0.5
CADMIUM,SED (MG/KG-DRY)	1028	0.3
CHROMIUM,SED (MG/KG-DRY)	1029	220
COPPER,SED(MG/KG-DRY)	1043	96
MERCURY,SED(MG/KG-DRY)	71921	1.56
NICKEL,SED (MG/KG-DRY)	1068	12
LEAD,SED (MG/KG-DRY)	1052	136
SELENIUM,SED (MG/KG-DRY)	1148	0.7
SILVER,SED (MG/KG-DRY)	1078	0.1
THALLIUM,SED(MG/KG-DRY)	34480	<18.7
ZINC,SED (MG/KG-DRY)	1093	122
ANTIMONY,SED (MG/KG-DRY)	1098	<37

ENVIRONMENTAL SCIENCE & ENGINEERING 08/31/83 FIELD GROUP FRSS1 STATUS IS FINAL

PROJECT NUMBER 83801210
SAMPLES: SED9
PROJECT MANAGER DAVE MIZELL

PROJECT NAME FRENCH LTD HAZWASTE
PARAMETERS: SED1
FIELD GROUP LEADER RICKFOLKEMER

		SAMPLE NUMBERS						
		S001	S002	S003	S004	S005	S006	S006D
PARAMETERS	STORET #	230009	230010	230011	230012	230013	230014	230015
DATE		4/14/83	4/16/83	4/7/83	4/14/83	4/14/83	4/16/83	4/16/83
TIME		1245	1615	1145	930	1415	1500	1500
SOLIDS (% WET WT)	70318	78.2	45.1	46.7	55.6	47.1	30.0	33.9
CARBON,TOC,SED(G/KG-DRY)	687	45.0	21.5	24.9	44.9	20.7	19.2	18.1
TOX,SED(UG/KG-DRY)	99263	330000	140000	60000	256000	17200	82700	85400
PHENOLS,SED(UG/KG-DRY)	32731	NA	NA	NA	NA	NA	NA	NA
TOE,SED(MG/KG-WET)	99121	337000	1230	646	313000	421	646	647

ENVIRONMENTAL SCIENCE & ENGINEERING 08/31/83 FIELD GROUP FRSS1 STATUS IS FINAL

PROJECT NUMBER 83801210
SAMPLES: SED11
PROJECT MANAGER DAVE MIZELL

PROJECT NAME FRENCH LTD HAZWASTE
PARAMETERS: FRS1
FIELD GROUP LEADER RICKFOLKEMER

SAMPLE NUMBERS

PARAMETERS	STORET #	S001 230009	S003 230011	S004 230012	S005 230013
DATE		4/14/83	4/7/83	4/14/83	4/14/83
TIME		1245	1145	930	1415
1,4-DICHLBENZENE,SED UG/KG-DRY	34574	<18000	<230	<20000	<260
1,2-DICHLBENZENE,SED UG/KG-DRY	34539	<20000	<260	<23000	<280
HEXACHL*ETHANE,SED UG/KG-DRY	34399	<36000	<450	<40000	<510
BIS(2-CHLETHYL)ETHER SD,UG/KG-D	34276	<18000	<230	<20000	<260
BIS(2-CHLETHOX)MTHAN SD,UG/KG-D	34281	<94000	<1100	<94000	<1200
BIS(2-CHLISOPR)ETHER SD,UG/KG-D	34286	<94000	<1100	<94000	<1200
1,2-DIPH*HYDRAZ.,SED UG/KG-DRY	34349	<7300	<93	<8200	<110
N-NITROSODIMETHYLAM, SD,UG/KG-D	34441	<81000	<1100	<90000	<1200
N-NITROSOD-N-PROP,SD UG/KG-DRY	34431	<94000	<1100	<94000	<1200
1,2,4-TRICHL*BENZENE SD,UG/KG-D	34554	<27000	<330	<30000	<390
HEXACHLBUTADIENE,SED UG/KG-DRY	39705	<50000	<640	<56000	<720
NAPHTHALENE,SED(UG/ KG-DRY)	34445	6800	<80	480000	<90
ISOPHORONE,SED(UG/KG -DRY)	34411	<9400	<120	<11000	<140
HEXACHLCYCLOPENT,SED UG/KG-DRY	34389	<40000	<510	<45000	<560
2-CHLNAPHTHALENE,SED UG/KG-DRY	34584	<13000	<160	<14000	<200
ACENAPHTHYLENE,SED UG/KG-DRY	34203	37000	<93	280000	<110
ACENAPHTHENE,SED UG/KG-DRY	34208	<14000	<180	68000	<200
2,6-DNT,SED(UG/KG- DRY)	34629	<45000	<570	<50000	<650
2,4-DNT,SED(UG/KG- DRY)	34614	<32000	<400	<35000	<460
N-NITROSODIPHENYLAM, SD,UG/KG-D	34436	<19000	<240	<21000	<280

ENVIRONMENTAL SCIENCE & ENGINEERING 08/31/83 FIELD GROUP FRSS1 STATUS IS FINAL

PROJECT NUMBER #3801210 PROJECT NAME FRENCH LTD HAZWASTE
SAMPLES:
PROJECT MANAGER DAVE MIZELL FIELD GROUP LEADER RICKFOLKEMER

SAMPLE NUMBERS

PARAMETERS	STORET #	S001 230009	S003 230011	S004 230012	S005 230013
DATE		4/14/83	4/7/83	4/14/83	4/14/83
TIME		1245	1145	930	1415
HEXACLRBENZENE,SED UG/KG-DRY	39701	<34000	<430	<38000	<480
4-BRPHNL PHNL ETHER SD,UG/KG-D	34639	<110000	<1400	<130000	<1600
DIMETHYL PHTHALATE, SD,UG/KG-D	34344	<11000	<140	<12000	<150
DIETHYL PHTHALATE, SD,UG/KG-D	34339	<8400	<110	<9400	<120
DI-N-BUTYL PHTHALATE SD,UG/KG-D	39112	<5300	<70	<5900	<80
BUTYL BEN.PHTHALATE SD,UG/KG-D	34295	<12000	<150	<13000	<170
BIS(2-ETHYLHEX)PHTH, SD,UG/KG-D	39102	<8400	<110	<9400	<120
DI-N-OCTYL PHTHALATE SD,UG/KG-D	34599	<5300	220	<5900	175
PHENANTHRENE,SED(UG/KG-DRY)	34464	19000	<140	360000	<150
ANTHRACENE,SED(UG/KG-DRY)	34223	<12000	<120	16000	<140
FLUORANTHENE,SED(UG/KG-DRY)	34379	98000	<110	140000	<120
PYRENE,SED(UG/KG-DRY)	34472	110000	<110	110000	<120
BENZIDINE,SED(UG/KG-DRY)	39121	<31000	<310	<27000	<350
CHRYSENE,SED(UG/KG-DRY)	34323	<12000	<120	14000	<140
BENZO(A)ANTHRACENE, SD,UG/KG-D	34529	55000	<240	23000	<280
3,3-DICHLBENZIDINE, SD,UG/KG-D	34634	<30000	<370	<33000	<420
BENZO(B)FLUORAN,SED(UG/KG-DRY)	34233	32000	<120	25000	<140
BENZO(K)FLUORAN,SED UG/KG-DRY	34245	<12000	<120	<11000	<140
BENZO(A)PYRENE,SED UG/KG-DRY	34250	<14000	<180	<16000	<200
INDENO(1,2,3-CD)PYR, SD,UG/KG-D	34406	<19000	<240	<21000	280

ENVIRONMENTAL SCIENCE & ENGINEERING 08/31/83 FIELD GROUP FRSS1 STATUS IS FINAL

PROJECT NUMBER 83801210
SAMPLES:
PROJECT MANAGER DAVE MIZELL

PROJECT NAME FRENCH LTD HAZWASTE
FIELD GROUP LEADER RICKFOLKEMER

SAMPLE NUMBERS

PARAMETERS	STORET #	S001 230009	S003 230011	S004 230012	S005 230013
DATE		4/14/83	4/7/83	4/14/83	4/14/83
TIME		1245	1145	930	1415
DIBENZO(A,H)ANTHRA, SD,UG/KG-D	34559	<31000	<310	<27000	350
BENZO(GHI)PERYLENE, SD,UG/KG-D	34524	<20000	<250	<23000	<280
2,3,7,8-TCDD,SED(UG/KG-DRY)	34678	<170000	<2200	<190000	<2500
FLUORENE,SED(UG/KG-DRY)	34384	<13000	<160	130000	<200
4-CHLPHYLPHENYLETHER SD,UG/KG-D	34644	<34000	<430	<38000	<480
P-CHLOR-M-CRESOL,SED UG/KG-DRY	34455	<30000	<370	<33000	<240
2-CHLOROPHENOL,SED, UG/KG-DRY	34589	<21000	<270	<24000	<170
2,4-DICHL*PHENOL,SED UG/KG-DRY	34604	<31000	<390	<34000	<250
2,4-DIMET*PHENOL,SED UG/KG-DRY	34609	<23000	<300	<26000	<190
2,4-DINIT*PHENOL,SED UG/KG-DRY	34619	<31000	<310	<27000	<200
4,6-DINIT*CRESOL,SED UG/KG-DRY	34660	<69000	<880	<77000	<560
2-NITROPHENOL,SED(UG/KG-DRY)	34594	<40000	<510	<45000	<320
4-NITROPHENOL,SED(UG/KG-DRY)	34649	<56000	<700	<62000	<450
PENTACHLPHENOL,SED UG/KG-DRY	39061	<80000	<1100	<89000	<640
PHENOL,SED(UG/KG-DRY)	34695	<19000	<240	<21000	<160
2,4,6-TRICHLPHNL,SED UG/KG-DRY	34624	<39000	<490	<44000	<320

ENVIRONMENTAL SCIENCE & ENGINEERING 1/11/84 STATUS: PRELIMINARY

PROJECT NUMBER 12422426
FIELD GROUP: FRS02
PARAMETERS: ALL SAMPLES: ALL

PROJECT NAME TRENCH PHASE 2
PROJECT MANAGER: RICK FOLKEMER
FIELD GROUP LEADER: R.FOLKEMER

PARAMETERS	STORET #	S007 299200	S008 299201	S009 299202	S010 299203	SAMPLE NUMBERS S011 299204
DATE		11/30/83	11/25/83	11/25/83	11/25/83	11/25/83
TIME		1730	1615	1515	1630	1645
TOE,SED(MG/KG-DRY)	99344	698	1630	602	<669	13100
CARBON,TOC,SED(G/KG-DRY)	687	18.3	39.2	12.3	1.65	11.5
TOX,SED(UG/KG-DRY)	99263	1900	2300	2700	1000	840
SOLIDS (% WET WT)	70318	67.4	48.4	48.7	87.9	83.3
ACROLEIN,SED(UG/KG-DRY)	34213	NA	NA	<920	NA	NA
ACRYLONITRILE,SED(UG/KG-DRY)	34218	NA	NA	<920	NA	NA
BENZENE,SED(UG/KG-DRY)	34237	NA	NA	<14	NA	NA
BROMOMETHANE,SED(UG/KG-DRY)	34416	NA	NA	<76	NA	NA
BROMODICHLOROMETHANE D,UG/KG-D	34330	NA	NA	<31	NA	NA
BROMOFORM,SED(UG/KG-DRY)	34290	NA	NA	<64	NA	NA
CARBON TETRACHLORIDE SD(UG/KG-D	34299	NA	NA	<70	NA	NA
CHLOROBENZENE,SED(UG/KG-DRY)	34304	NA	NA	<19	NA	NA
CHLOROETHANE,SED(UG/KG-DRY)	34314	NA	NA	<86	NA	NA
2-CHL'ETHYLVINLETHER SD,UG/KG-D	34579	NA	NA	<53	NA	NA
CHLOROFORM,SED(UG/KG-DRY)	34318	NA	NA	<30	NA	NA
CHLOROMETHANE,SED(UG/KG-DRY)	34421	NA	NA	<46	NA	NA
DIBROMOCHLOROMETHANE SD,UG/KG-D	34309	NA	NA	<52	NA	NA
DICHL'DIFLUO'METHANE SD,UG/KG-D	34334	NA	NA	<74	NA	NA
1,1DICHL'ETHANE,SED,UG/KG-DRY	34499	NA	NA	<25	NA	NA
1,2-DICHLOROETHANE,SD,UG/KG-D	34534	NA	NA	<48	NA	NA

ENVIRONMENTAL SCIENCE & ENGINEERING 1/11/84 STATUS: PRELIMINARY

PROJECT NUMBER 82422421
FIELD GROUP: FPS02
PARAMETERS: ALL SAMPLES: ALL

PROJECT NAME FRENCH PHASE 2
PROJECT MANAGER: RICK FOLKEMER
FIELD GROUP LEADER: R.FOLKEMER

PARAMETERS	STORET #	S007 299200	S008 299201	S009 299202	S010 299203	SAMPLE NUMBERS S011 299204
DATE		11/30/83	11/25/83	11/25/83	11/25/83	11/25/83
TIME		1730	1615	1515	1630	1645
1,1 DICHL'ETHENE,SED UG/KG-DRY	34504	NA	NA	<56	NA	NA
T-1,2-DICHLOROETHENE SD,UG/KG-D	34549	NA	NA	<50	NA	NA
1,2-DICHLOROPROPANE, SD,UG/KG-D	34544	NA	NA	<31	NA	NA
CIS-1,3-DICH'PROPENE SD,UG/KG-D	34702	NA	NA	<48	NA	NA
ETHYLBENZENE,SED(UG/ KG-DRY)	34374	NA	NA	<42	NA	NA
METHYLENE CHLOR.,SED UG/KG-DRY	34426	NA	NA	<49	NA	NA
1,1,2,2-TET'CH'ETHAN SD,UG/KG-D	34519	NA	NA	<27	NA	NA
TETCL'ETHLENE,SED UG/KG-DRY	34478	NA	NA	<84	NA	NA
1,1,1-TRICHL'ETHANE, SD,UG/KG-D	34509	NA	NA	<52	NA	NA
1,1,2-TRICHL'ETHANE, SD,UG/KG-D	34514	NA	NA	<54	NA	NA
TRICHLOROETHENE,SED UG/KG-DRY	34487	NA	NA	<53	NA	NA
TRICHLOROFLUOROMETH. SD,UG/KG-D	34491	NA	NA	<74	NA	NA
TOLUENE,SED(UG/KG- DRY)	34483	NA	NA	<23	NA	NA
VINYL CHLORIDE,SED UG/KG-DRY	34495	NA	NA	<55	NA	NA
T-1,3-DICH'PROPENE, SD,UG/KG-D	34697	NA	NA	<21	NA	NA
BIS(2-CHLETHYL)ETHER SD,UG/KG-D	34276	<85	NA	<330	NA	NA
ALDRIN,SED(UG/KG- DRY)	39333	NA	NA	<20.0	NA	NA
BHC,A,SED(UG/KG-DRY)	39076	NA	NA	<13.0	NA	NA
BHC,B,SED(UG/KG-DRY)	34257	NA	NA	<18.0	NA	NA
BHC,D,SED(UG/KG-DRY)	34262	NA	NA	<32.0	NA	NA

ENVIRONMENTAL SCIENCE & ENGINEERING 11/11/84 STATUS: PRELIMINARY

PROJECT NUMBER 82401420
FIELD GROUP: FRS02
PARAMETERS: ALL SAMPLES: ALL

PROJECT NAME FRENCH PHASE 2
PROJECT MANAGER: RICK FOLKEMER
FIELD GROUP LEADER: R.FOLKEMER

PARAMETERS	STORET #	S007 299200	S008 299201	S009 299202	S010 299203	S011 299204
						SAMPLE NUMBERS
DATE		11/30/83	11/25/83	11/25/83	11/25/83	11/25/83
TIME		1730	1615	1515	1630	1645
BHC,G(LINDANE)SED UG/KG-DRY	39783	NA	NA	<18	NA	NA
CHLORDANE,SED(UG/KG-DRY)	39351	NA	NA	<260	NA	NA
DDD,PP',SED(UG/KG-DRY)	39311	NA	NA	<65	NA	NA
DDE,PP',SED (UG/KG-DRY)	39321	NA	NA	<32	NA	NA
DDT,PP',SED(UG/KG-DRY)	39301	NA	NA	<230	NA	NA
DIELDRIN,SED(UG/KG-DRY)	39383	NA	NA	<39	NA	NA
ENDOSULFAN,A,SED(UG/KG-DRY)	34364	NA	NA	<35	NA	NA
ENDOSULFAN,B,SED(UG/KG-DRY)	34359	NA	NA	<60	NA	NA
ENDOSULFAN SULF,SED, UG/KG-DRY	34354	NA	NA	<370	NA	NA
ENDRIN,SED(UG/KG-DRY)	39393	NA	NA	<72	NA	NA
HEPTACHLOR,SED(UG/KG-DRY)	39413	NA	NA	<23	NA	NA
HEPTACHLOR EPOX,SED UG/KG-DRY	39423	NA	NA	<24	NA	NA
TOXAPHENE,SED(UG/KG-DRY)	39400	NA	NA	<1800	NA	NA
ENDRIN ALD.,SED(UG/KG-DRY)	34369	NA	NA	<77	NA	NA
PCB-1016(UG/KG-D)	39514	<3.00	<74.0	NA	3.00	<2.50
PCB-1260(UG/KG-D)	39511	14.0	150	NA	8.0	17.0
1,3-DICHLBENZENE,SED UG/KG-DRY	34569	<91	NA	<350	NA	NA
1,4-DICHLBENZENE,SED UG/KG-DRY	34574	<85	NA	<330	NA	NA
1,2-DICHLBENZENE,SED UG/KG-DRY	34539	<95	NA	<370	NA	NA
HEXACHLOETHANE,SED UG/KG-DRY	34399	<180	NA	<640	NA	NA

ENVIRONMENTAL SCIENCE & ENGINEERING 1/11/84 STATUS: PRELIMINARY

PROJECT NUMBER 82422420
FIELD GROUP: FRS02
PARAMETERS: ALL SAMPLES: ALL

PROJECT NAME FRENCH PHASE 2
PROJECT MANAGER: RICK FOLKEMER
FIELD GROUP LEADER: R.FOLKEMER

SAMPLE NUMBERS

PARAMETERS	STORET #	S007 299200	S008 299201	S009 299202	S010 299203	S011 299204
DATE		11/30/83	11/25/83	11/25/83	11/25/83	11/25/83
TIME		1730	1615	1515	1630	1645
BIS(2-CHLETHOX)MTHAN SD,UG/KG-D	34281	<400	NA	<1500	NA	NA
BIS(2-CHLISOPR)ETHER SD,UG/KG-D	34286	<400	NA	<1500	NA	NA
NITROBENZENE,SED(UG/ KG-DRY)	34450	<85	NA	<330	NA	NA
1,2-DIPH*HYDRAZ.,SED UG/KG-DRY	34349	<36	NA	<140	NA	NA
N-NITROSODIMETHYLAM, SD,UG/KG-D	34441	<390	NA	<1500	NA	NA
N-NITROSOD-N-PROP,SD UG/KG-DRY	34431	<400	NA	<1500	NA	NA
1,2,4-TRICHL*BENZENE SD,UG/KG-D	34554	<130	NA	<480	NA	NA
HEXACHLBUTADIENE,SED UG/KG-DRY	39705	<260	NA	<910	NA	NA
NAPHTHALENE,SED(UG/ KG-DRY)	34445	<32	NA	<120	NA	NA
ISOPHORONE,SED(UG/KG -DRY)	34411	<46	NA	<170	NA	NA
HEXACHLCYCLOPENT,SED UG/KG-DRY	34389	<200	NA	<720	NA	NA
2-CHLNAPHTHALENE,SED UG/KG-DRY	34584	<61	NA	<230	NA	NA
ACENAPHTHYLENE,SED UG/KG-DRY	34203	<36	NA	<140	NA	NA
ACENAPHTHENE,SED UG/KG-DRY	34208	<66	NA	<250	NA	NA
2,6-DNT,SED(UG/KG- DRY)	34629	<230	NA	<800	NA	NA
2,4-DNT,SED(UG/KG- DRY)	34614	<170	NA	<580	NA	NA
N-NITROSODIPHENYLAM, SD,UG/KG-D	34436	<91	NA	<350	NA	NA
HEXACLBENZENE,SED UG/KG-DRY	39701	<170	NA	<600	NA	NA
4-BRPHNL PHNL ETHER SD,UG/KG-D	34639	<520	NA	<2000	NA	NA
DIMETHYL PHTHALATE, SD,UG/KG-D	34344	<51	NA	<190	NA	NA

ENVIRONMENTAL SCIENCE & ENGINEERING 01/11/84 STATUS: PRELIMINARY

PROJECT NUMBER 82422420
FIELD GROUP: FPS02
PARAMETERS: ALL SAMPLES: ALL

PROJECT NAME FRENCH PHASE 2
PROJECT MANAGER: RICK FOLKEMER
FIELD GROUP LEADER: R.FOLKEMER

		SAMPLE NUMBERS				
PARAMETERS	STORET #	S007 299200	S008 299201	S009 299202	S010 299203	S011 299204
DATE		11/30/83	11/25/83	11/25/83	11/25/83	11/25/83
TIME		1730	1615	1515	1630	1645
DIETHYL PHTHALATE, SD,UG/KG-D	34339	<41	NA	<150	NA	NA
DI-N-BUTYL PHTHALATE SD,UG/KG-D	39112	<26	NA	<95	NA	NA
BUTYL BEN.PHTHALATE SD,UG/KG-D	34295	<55	NA	<210	NA	NA
BIS(2-ETHYLHEX)PHTH, SD,UG/KG-D	39102	2200	NA	25000	NA	NA
DI-N-OCTYL PHTHALATE SD,UG/KG-D	34599	5600	NA	18000	NA	NA
PHENANTHRENE,SED(UG/KG-DRY)	34464	<51	NA	<190	NA	NA
ANTHRACENE,SED(UG/KG-DRY)	34223	<46	NA	<170	NA	NA
FLUORANTHENE,SED(UG/KG-DRY)	34379	<41	NA	<150	NA	NA
PYRENE,SED(UG/KG-DRY)	34472	<41	NA	<150	NA	NA
BENZIDINE,SED(UG/KG-DRY)	39121	<120	NA	<440	NA	NA
CHRYSENE,SED(UG/KG-DRY)	34323	<46	NA	<170	NA	NA
BENZO(A)ANTHRACENE, SD,UG/KG-D	34529	<91	NA	<350	NA	NA
3,3-DICHLBENZIDINE, SD,UG/KG-D	34634	<140	NA	<540	NA	NA
BENZO(B)FLUORAN,SED(UG/KG-DRY)	34233	<46	NA	<170	NA	NA
BENZO(K)FLUORAN,SED UG/KG-DRY	34245	<46	NA	<170	NA	NA
BENZO(A)PYRENE,SED UG/KG-DRY	34250	<66	NA	<250	NA	NA
INDENO(1,2,3-CD)PYR, SD,UG/KG-D	34406	<91	NA	<350	NA	NA
DIBENZO(A,H)ANTHRA, SD,UG/KG-D	34559	<120	NA	<440	NA	NA
BENZO(GHI)PERYLENE, SD,UG/KG-D	34524	<95	NA	<370	NA	NA
2,3,7,8-TCDD,SED(UG/KG-DRY)	34678	<810	NA	<3100	NA	NA

ENVIRONMENTAL SCIENCE & ENGINEERING 1/11/84 STATUS: PRELIMINARY

PROJECT NUMBER F2422420
FIELD GROUP: FPS02
PARAMETERS: ALL SAMPLES: ALL

PROJECT NAME FRENCH PHASE 2
PROJECT MANAGER: RICK FOLKEMER
FIELD GROUP LEADER: R.FOLKEMER

		SAMPLE NUMBERS				
		S007	S008	S009	S010	S011
PARAMETERS	STORET #	299200	299201	299202	299203	299204
DATE		11/30/83	11/25/83	11/25/83	11/25/83	11/25/83
TIME		1730	1615	1515	1630	1645
FLUORENE,SED(UG/KG-DRY)	34384	<61	NA	<230	NA	NA
4-CHLPHYLPHENYLETHER SD,UG/KG-D	34644	<170	NA	<600	NA	NA
P-CHLOR-M-CRESOL,SED UG/KG-DRY	34455	NA	NA	<540	NA	NA
2-CHLOROPHENOL,SED, UG/KG-DRY	34589	NA	NA	<390	NA	NA
2,4-DICHL*PHENOL,SED UG/KG-DRY	34604	NA	NA	<560	NA	NA
2,4-DIMET*PHENOL,SED UG/KG-DRY	34609	NA	NA	<410	NA	NA
2,4-DINIT*PHENOL,SED UG/KG-DRY	34619	NA	NA	<440	NA	NA
4,6-DINIT*CRESOL,SED UG/KG-DRY	34660	NA	NA	<1300	NA	NA
2-NITROPHENOL,SED(UG/KG-DRY)	34594	NA	NA	<720	NA	NA
4-NITROPHENOL,SED(UG/KG-DRY)	34649	NA	NA	<1100	NA	NA
PENTACHLPHENOL,SED UG/KG-DRY	39061	NA	NA	<1500	NA	NA
PHENOL,SED(UG/KG-DRY)	34695	NA	NA	<350	NA	NA
2,4,6-TRICHLPHNL,SED UG/KG-DRY	34624	NA	NA	<700	NA	NA

BOOKMARK

APPENDIX L

Chemical Results--Fish Tissue

ENVIRONMENTAL SCIENCE & ENGINEERING 09/12/83 FIELD GROUP FRF-1 STATUS IS FINAL

PROJECT NUMBER 83801210
SAMPLES: ALL
PROJECT MANAGER DAVE MIZELL

PROJECT NAME FRENCH LTD HAZWASTE
PARAMETERS: ALL
FIELD GROUP LEADER RICK FOLKEMER

SAMPLE NUMBERS

PARAMETERS	STORET #	B101 230100	B102 230101	B103 230102
DATE		4/14/83	4/14/83	4/14/83
TIME		1500	1500	1500
HEPTACHLOR,TISS(UG/KG-WET)	39414	<1	<1	<1
ALDRIN,TISS(UG/KG-WET)	39334	<1	<1	<1
HEPTACHLOR,EPOX.TISS UG/KG-WET	39424	<1	<1	<1
ENDOSULFAN,A,TISS UG/KG-WET	99359	<1	<1	<1
DIELDRIN,TISS(UG/KG-WET)	39387	<1	<1	<1
ENDRIN,TISS(UG/KG-WET)	39397	<2	<2	<1
ENDOSULFAN,B,TISS UG/KG-WET	99360	<1	<1	<1
DDT,PP',TIS(UG/KG-WET)	39317	<3	<3	<3
CHLORDANE,TISS(UG/KG -WET	39349	<28	<28	<28
TOXAPHENE,TISS(UG/KG -WET)	39407	<44	<44	<44
PCBS,TOTAL,TISS(UG/KG-WET)	39520	18	194	41
THALLIUM,TISS (UG/G-WET)	1073	<6.62	<6.33	<6.37
CHROMIUM,TISS(UG/G-WET)	71939	<0.10	<0.09	<0.10
ARSENIC,TISS (UG/G-WET)	1004	<0.93	<0.89	<0.89
CADMIUM,TISS(UG/G-WET)	71940	<0.13	<0.13	<0.13
COPPER,TISS(UG/G-WET)	71937	0.93	1.90	0.92
NICKEL,TISS (UG/G-WET)	1069	<0.40	<0.38	<0.38
SELENIUM,TISS (UG/G-WET)	1149	<1.59	<1.52	<1.53
ANTIMONY,TISS (UG/G-WET)	1099	<1.19	<1.14	<1.15
BERYLLIUM,TISS(UG/G-	34252	<0.199	<0.190	<0.191

ENVIRONMENTAL SCIENCE & ENGINEERING 09/12/83 FIELD GROUP FRF-1 STATUS IS FINAL

PROJECT NUMBER 83801210
SAMPLES:
PROJECT MANAGER DAVE MIZELL

PROJECT NAME FRENCH LTD HAZWASTE

FIELD GROUP LEADER RICK FOLKEMER

SAMPLE NUMBERS

PARAMETERS	STORET #	B101 230100	B102 230101	B103 230102
DATE		4/14/83	4/14/83	4/14/83
TIME		1500	1500	1500
MERCURY,TISS (UG/G-WET)	71930	0.17	0.08	0.09
LEAD,TISS (UG/G-WET)	71936	<0.17	<0.16	<0.16
SILVER,TISS (UG/G-WET)	34474	<0.03	<0.03	<0.03
ZINC,TISS (UG/G-WET)	71938	6.03	4.94	12.1
BHC,D,TISS (UG/KG-WET)	81821	<1	<1	<1
BHC,A,TISS (UG/KG-WET)	81819	<1	<1	<1
BHC,G(LINDANE)TISS UG/KG-WET	39784	<1	<1	<1
ENDOSULFAN SULF. UG/KG-WET	99117	<1.00	<1.00	<5.00
ENDRIN ALDEHYDE,TISS UG/KG-WET	99118	<1.00	<1.00	<5.00
BHC,B,TISS (UG/KG-WET)	81820	<1	<1	<1
DDD,PP',TISS (UG/KG-WET)	81860	<1	<1	<1
DDE,PP',TISS (UG/KG-WET)	81861	<1	<1	<1

ENVIRONMENTAL SCIENCE & ENGINEERING 01/11/84 STATUS: PRELIMINARY

PROJECT NUMBER 8242242C
FIELD GROUP: FRF2
PARAMETERS: ALL SAMPLES: ALL

PROJECT NAME FRENCH PHASE 2
PROJECT MANAGER: RICK FOLKEMER
FIELD GROUP LEADER: R.FOLKEMER

		SAMPLE NUMBERS					
		FT04	FT05	FT06	FT07	FT08	FT09
PARAMETERS	STORET #	299100	299101	299102	299103	299104	299105
DATE		11/27/83	11/27/83	11/27/83	11/27/83	11/27/83	11/27/83
TIME		1030	1030	1130	1130	1330	1330
COPPER,TISS(UG/G-WET)	71937	0.28	0.15	0.58	0.15	0.17	0.11
MERCURY,TISS (UG/G-WET)	71930	<0.22	<0.21	<0.21	<0.25	<0.23	<0.22
ZINC,TISS (UG/G-WET)	71938	3.56	6.70	6.02	4.85	5.35	6.71
PCBS,TOTAL,TISS(UG/KG-WET)	39520	22	106	68	392	180	102

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